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Hydrology of the Carbonate Rocks of the Lancaster 15-minute Quadrangle, Pennsylvania

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PROGRESS REPORT 171

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by Harold Meisler and Albert E. Becher

U. S. Geological Survey

Prepared by the United States Geological Survey, Ground Water Branch, in cooperation with the Pennsylvania Geological Survey

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PROGRESS REPORT ON THE HYDROLOGY OF THE CARBONATE ROCKS OF THE LANCASTER 15-MINUTE QUADRANGLE, PENNSYLVANIA

By

HAROLD MEISLER AND ALBERT E. BECHER

ABSTRACT

Limestone and dolomite strata of Cambrian and Ordovician age underlie a lowland that occupies about 60 percent of the Lancaster quadrangle. The stratigraphic units, from oldest to youngest, are the Vintage, Kinzers, Ledger, and Elbrook Formations and the Conococheague Group of Cambrian age; and the Beekmantown Group and Conestoga Formation of Ordovician age.

The lowland contains several anticlinal ridges that are underlain by Lower Cambrian quartzites, schists, slates, and phyllites of the Chickies, Harpers, and Antietam Formations. It is bordered on the north by highlands underlain by shale of the Cocalico Formation of Ordovician age.

Ground water in the carbonate rocks occurs within bedding and cleavage planes, and in joints, faults, and other fractures. Where these openings have been enlarged by solution, large amounts of water are available. The number and size of openings and the degree of interconnection between them determine the ability of the rocks to transmit water.

Specific capacities of 247 wells pumped for 1 hour range from 0.02 to 600 gpm (gallons per minute) per foot of drawdown; the median specific capacity is 0.91. Twenty-five percent of the specific capacities are less than 0.14, and 75 percent are less than 5.0.

Specific capacities of wells in valleys are generally greater than those of wells on ridges. Of 16 wells having specific capacities greater than 50, 12 are in valleys, 1 is on a ridge, and 3 are in intermediate topographic positions.

Large-capacity wells tend to be shallower than small-capacity wells. The median specific capacity is 4.8 gpm per foot of drawdown for wells less than 50 feet deep, 2.5 for wells 50 to 99 feet deep, 0.51 for wells 100 to 199 feet deep, and 0.08 for wells 200 to 600 feet deep.

Ground water in the carbonate rocks is of the calcium bicarbonate type. The water is very hard—approximately 90 percent of 37 wells sampled have more than 270 ppm (parts per million) hardness. The median hardness is 308 ppm. Thirteen of the 37 wells sampled contain more than 45 ppm nitrate (maximum concentration considered acceptable by the U. S. Public Health Service), and the median nitrate concentration is 33 ppm.

INTRODUCTION

PURPOSE AND SCOPE OF THE STUDY

Lancaster County, long known as a rich agricultural region, has a rapidly growing industrial complex, chiefly in the vicinity of the city of Lancaster. Urban expansion and suburban development have kept pace with this growth, and the demand for water to supply both domestic and industrial needs has increased. Some of the demand is being met by ground water.

The greatest potential source of ground water in Lancaster County is the crystalline carbonate rocks that underlie nearly half the county. An evaluation of the occurrence, movement, and quality of ground water in these rocks is necessary for the efficient development of the resource. In September 1962, the U. S. Geological Survey, in cooperation with the Pennsylvania Geological Survey, began a study of the geology and hydrology of carbonate rocks of the Lancaster 15-minute quadrangle.

This report contains basic hydrologic and chemical data collected in the area. A more complete report will be prepared upon completion of the study, in 1967.

LOCATION AND GEOGRAPHIC SETTING

The area underlain by carbonate rocks in the Lancaster 15-minute quadrangle in Pennsylvania is shown in Figure 1. This 15-minute quadrangle is divided into the Manheim, Lititz, Lancaster, and Columbia East 7½-minute quadrangles.

The carbonate rocks underlie a gently rolling lowland throughout much of the Lancaster quadrangle. Interspersed throughout the lowland and along its northern boundary are rocks that are more resistant to erosion than the carbonates. These rocks form hills that rise 300 to 600 feet above the lowland.

Chickies Creek and Conestoga Creek drain almost all of the Lancaster 15-minute quadrangle. (See Plate 1.) They flow southwestward across the quadrangle into the Susquehanna River. Chickies Creek drains the western one-third of the quadrangle; Conestoga Creek and its tributary, Little Conestoga Creek, drain the eastern two-thirds of the quadrangle.

METHODS OF INVESTIGATION

Approximately 500 municipal, industrial, and domestic wells and springs were inventoried during this investigation. The well records are given in Table 1, and the spring records in Table 2. Locations of wells and springs are shown in Plate 1. Short-term (1-hour) pumping tests were made at 247 wells in order to determine specific capacities of the wells. Continuous water-level records were obtained at 5 wells.

Ground-water samples were collected from 37 wells and springs, and complete analyses of the samples were made by the Quality of Water Branch, U. S. Geological Survey. Hardness as $CaCO_3$ and specific conductance of water from approximately 450 wells were determined in the field.

PREVIOUS INVESTIGATIONS

The occurrence of ground water in the Lancaster quadrangle is discussed by Hall (1934) as part of a reconnaissance report on ground water in southeastern Pennsylvania.

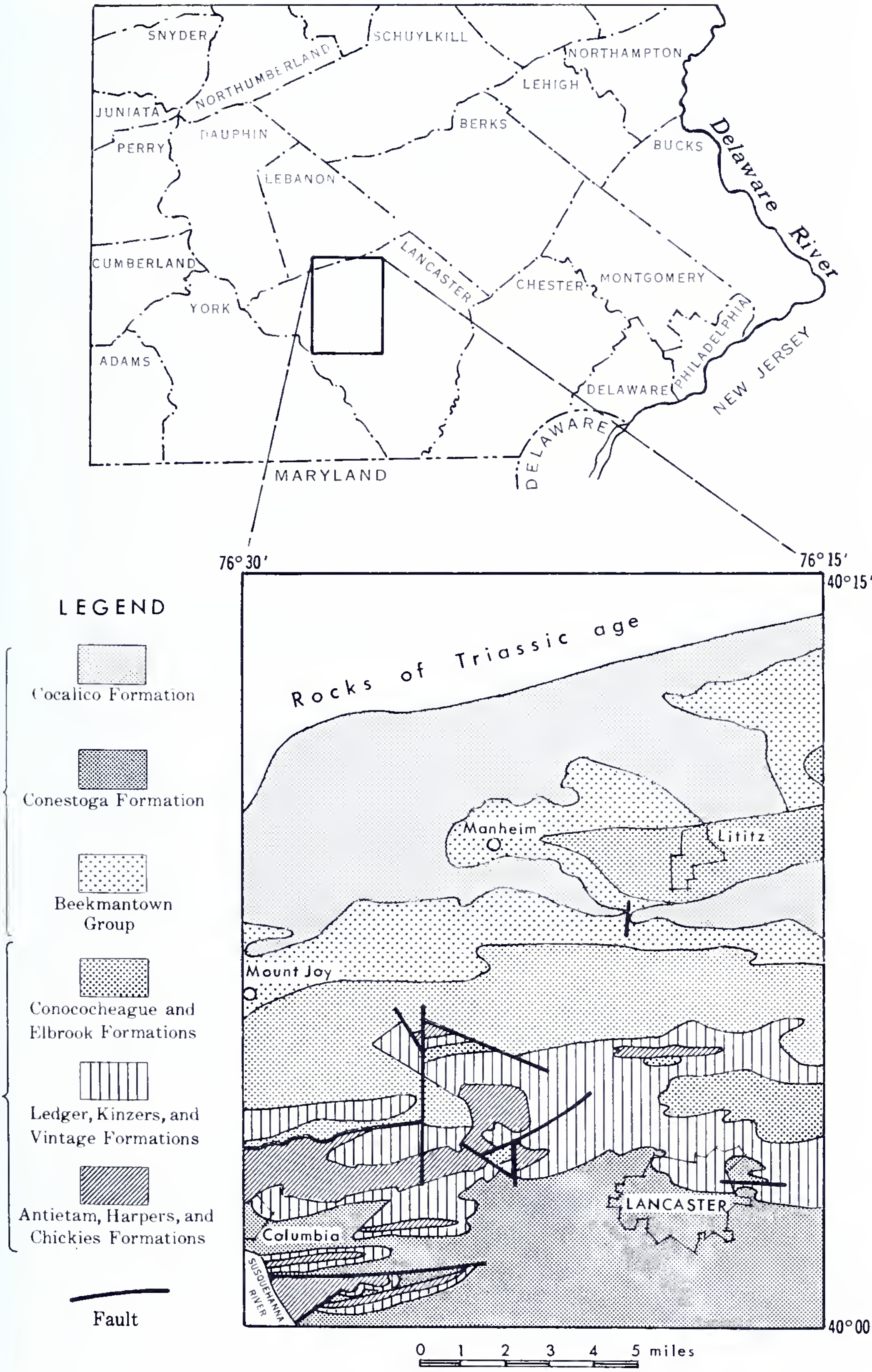
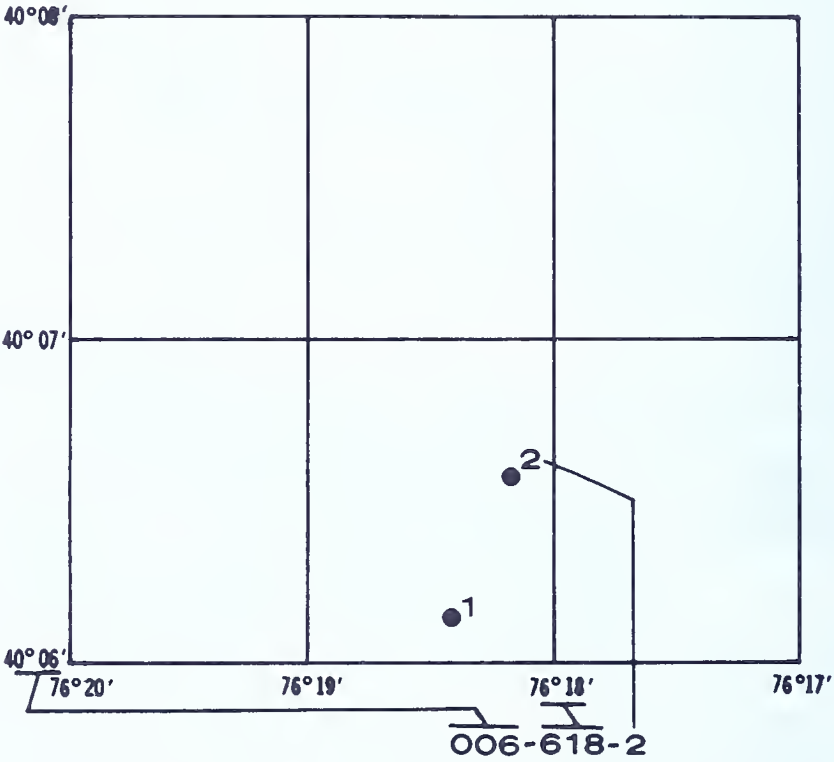


Figure 1. Maps showing the location and geology of the Lancaster quadrangle.

The geology of the Lancaster 15-minute quadrangle is described by Jonas and Stose (1930) in Pennsylvania Geological Survey Atlas 168. Although this report is a cooperative product of the Pennsylvania Topographic and Geologic Survey and the U. S. Geological Survey, the geologic nomenclature accords with that of the State Survey; it differs some from that of the U. S. Geological Survey.

WELL-NUMBERING SYSTEM

The well-numbering system used in this report shows the location of wells and springs according to the latitude and longitude system illustrated in Figure 2.



Well 006-618-2 was the second well inventoried in the 1-minute area north of the 40°06′ parallel of latitude and west of the 76°18′ meridian of longitude.

Figure 2. Diagram showing the well-numbering system.

The latitude and longitude system consists of a statewide grid of 1-minute parallels of latitude and 1-minute meridians of longitude. Within a 1-minute area wells are numbered and springs are lettered consecutively in the order inventoried. For example, in the number *006-618-2,* which was assigned to a well near Neffsville in Lancaster County, the first segment (006) is composed of the last digit of the degrees (40) and the two digits of the minutes (06) that define the latitude on the south side of a

1-minute quadrangle; the second segment (618) consists of the last digit of the degrees (76) and the two digits of the minutes (18) that define the longitude on the east side of a 1-minute quadrangle; and the last segment (2) indicates the consecutive number assigned to the well as it was inventoried. (See Plate 1.) Similarly, the spring numbered *005-629-A* was the first spring inventoried in the 1-minute quadrangle north of the 40°05′ parallel of latitude and west of the 76°29′ meridian of longitude.

CLIMATE

In Lancaster County summers are long, temperature extremes are moderate, and rainfall is abundant. The average annual precipitation at the U. S. Weather Bureau station at Lancaster for the years 1931 through 1955 was 43.13 inches. The average yearly temperature for the same period was 52.06° F. Approximately 33 percent of the total yearly rainfall takes place in June, July, and August, and 57 percent occurs in the 6-month period from April through September. Summer precipitation is predominantly of the thunderstorm type, and therefore is highly variable in quantity and areal distribution. Winter precipitation is related to a more general weather pattern, and therefore is more uniform in quantity and areal distribution. The following table gives the average monthly rainfall and temperature at Lancaster for the years 1931 through 1955.

Average monthly precipitation (in inches) and temperature (in degrees Fahrenheit) at the U. S. Weather Bureau, Lancaster, 1931-55

(From Kauffman, 1960)

Month	Precipitation	Temperature
January	3.16	30.4
February	2.61	31.1
March	3.45	40.1
April	3.45	49.8
May	3.54	61.3
June	4.01	70.2
July	4.85	74.5
August	5.28	72.3
September	3.31	65.3
October	3.27	54.0
November	3.21	42.9
December	2.99	32.8

ACKNOWLEDGMENTS

The authors are indebted to the many civic and business organizations, industrial firms, and individual well owners who allowed access to their wells for pumping tests, water-level measurements, and the collection of water samples. Especially helpful were Lititz Water Co., Millersville Borough Authority, Quaker State Metals Co., and U. S. Asbestos Co.

GEOLOGY

Limestone and dolomite of Cambrian and Ordovician age occupy a broad east-west-trending belt across central Lancaster County. These rocks form a lowland that is interrupted by anticlinal ridges in which Lower Cambrian quartzites, quartz schists, slates, and phyllites are exposed. The northern boundary of the carbonate rocks in the Lancaster quadrangle is formed by shale of the overlying Cocalico Formation of Ordovician age.

The sequence of Cambrian and Ordovician rocks in the Lancaster quadrangle, according to Jonas and Stose (1930), is given in Table 1.

The areal distribution of these strata in the Lancaster quadrangle is shown in Figure 1. The largest exposures of the quartzites, schists, and phyllites of the Antietam, Harpers, and Chickies Formations are in a complexly folded and faulted anticlinorium in the southwestern part of the quadrangle. In general, progressively younger strata crops out northward across the area. However, the Conestoga Formation, possibly the youngest carbonate-rock formation in the quadrangle, unconformably overlaps the Vintage, Kinzers, and Ledger Formations in the southern part of the quadrangle.

The structure of the Cambrian and Ordovician rocks in the Lancaster quadrangle is extremely complex, the strata being intensely folded and, in places, intricately faulted.

HYDROLOGY

PRINCIPLES

Ground water is the subsurface water in that part of the zone of saturation in which the interconnected pores, crevices, and other openings in the rock are filled with water under pressure equal to or greater than atmospheric. Rocks that are capable of yielding usable supplies of ground water to wells or springs are called aquifers. The openings that contain and transmit water in an aquifer are classified as primary or secondary. Primary openings are the interstitial voids formed during deposition of the sediments. The secondary openings are formed as a result of crustal

Table 1. Generalized section of the Cambrian and Ordovician strata in the Lancaster quadrangle, Pennsylvania

(Modified from Jonas and Stose, 1930)

System	Group or formation	Predominant physical character
Ordovician	Cocalico Formation	Dark-gray to bluish-black shale.
	Conestoga Formation	Blue thin-bedded limestone containing argillaceous partings; closely folded.
	Beekmantown Group	Light-bluish-gray limestone, magnesian limestone, and dark-gray dolomite.
Cambrian	Conococheague Group	Light- to dark-bluish-gray limestone and dark-gray dolomite; some beds are argillaceous and siliceous.
	Elbrook Formation	Light-gray to white laminated magnesian limestone containing sericitic partings.
	Ledger Formation	Light-gray, mottled, massive pure coarsely crystalline dolomite.
	Kinzers Formation	Gray to blue shale overlain by gray and white spotted limestone containing interbeds of blue sandy dolomite.
	Vintage Formation	Dark-gray, knotty, argillaceous dolomite containing impure light-gray marble at base.
	Antietam Formation	Gray quartzite and quartz schist.
	Harpers Formation	Light-gray phyllite and dark-banded slate.
	Chickies Formation	Light-gray and white massive quartzite and quartz schist.

movement, solution, or rock-weathering processes that take place after the rock is formed.

Ground water in the carbonate rocks of the Lancaster quadrangle occurs almost entirely in the secondary openings. Water-filled openings along bedding and cleavage planes, joints, and faults can supply small to moderate amounts of water for domestic and farm use. Where these openings have been enlarged by solution, larger amounts of water are available for industrial and municipal use. The number and size of the openings and the degree of interconnection between them determine the ability of the carbonate rocks to transmit water to wells and springs.

Ground water may occur under either water-table or artesian conditions. Under water-table conditions, ground water is not confined, and the upper surface of the zone of saturation—called the water table—is

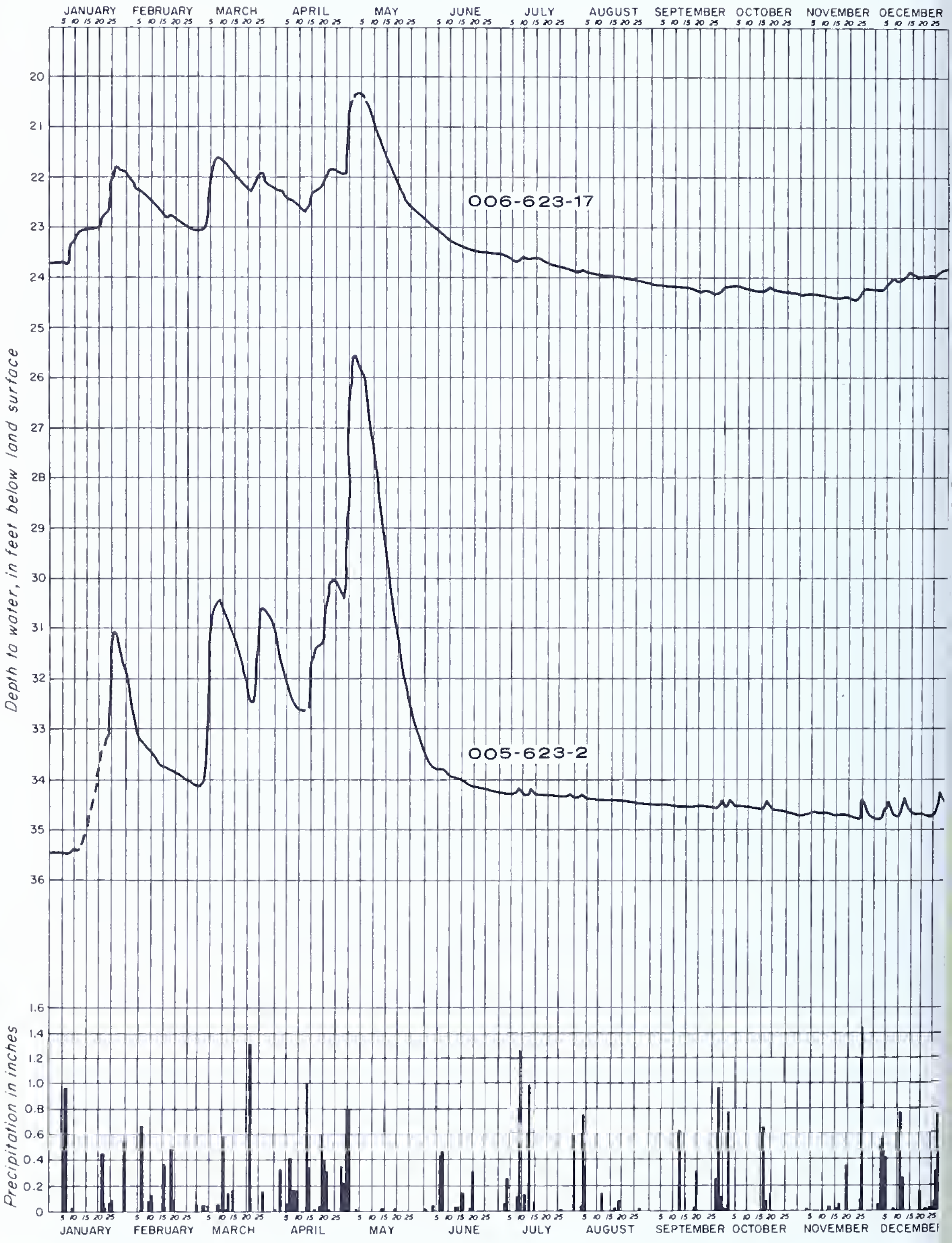


Figure 3. Hydrographs of wells 005-623-2 and 006-623-17 and precipitation at Landisville.

free to fluctuate. Where ground water is confined under hydrostatic pressure in a permeable rock by relatively impermeable overlying rocks, the water occurs under artesian conditions. When an artesian aquifer is penetrated by a well, the water will rise in the well above the upper surface of the aquifer to a level called the peizometric surface.

In the carbonate rocks of the Lancaster quadrangle, ground water is confined within crevices and solution channels. When a well penetrates such a water-bearing opening, the water will rise in the well above the level of the opening, and might be considered artesian. However, as there are no sharply defined aquifers or confining beds, the carbonate rocks should be thought of as a complex, nonhomogeneous water-table aquifer.

Precipitation is the source of all ground water in the carbonate rocks of the Lancaster quadrangle. The precipitation infiltrates downward through the soil and rock openings to the water table. Within the zone of saturation, ground water moves downward and laterally through rock openings from areas of recharge (where hydraulic potentials are high) to points of discharge (where hydraulic potentials are low). Discharge takes place primarily through springs, streams, and wells.

Under natural conditions, and over long periods of time, the amount of discharge from an aquifer is equal to the amount of recharge to the aquifer. Ground-water levels fluctuate in response to recharge and discharge—rising when recharge exceeds discharge and declining when discharge exceeds recharge.

Figure 3 shows hydrographs of wells 005-623-2 and 006-623-17 and precipitation for the calendar year 1964. Both wells show a general water-level rise from January to early May and a decline from May to November. Water levels generally decline during the growing season, because much of the precipitation is intercepted by vegetation before it can reach the water table. The lack of substantial recharge during the growing season is illustrated in another way by the hydrographs. Large water-level fluctuations in response to rainfall occur during the period from January to early May, whereas only small fluctuations occur during the period from May to December.

WATER-BEARING PROPERTIES OF THE CARBONATE ROCKS

Pumping tests 1 hour long were made on 247 wells in order to evaluate the ability of the carbonate rocks to yield water to wells. The results of the tests are given as the specific capacity of each well for 1 hour of pumping. Specific capacity is defined as the yield of a well per unit decline of water level, and is usually expressed as gallons per minute per foot of drawdown (gpm per ft).

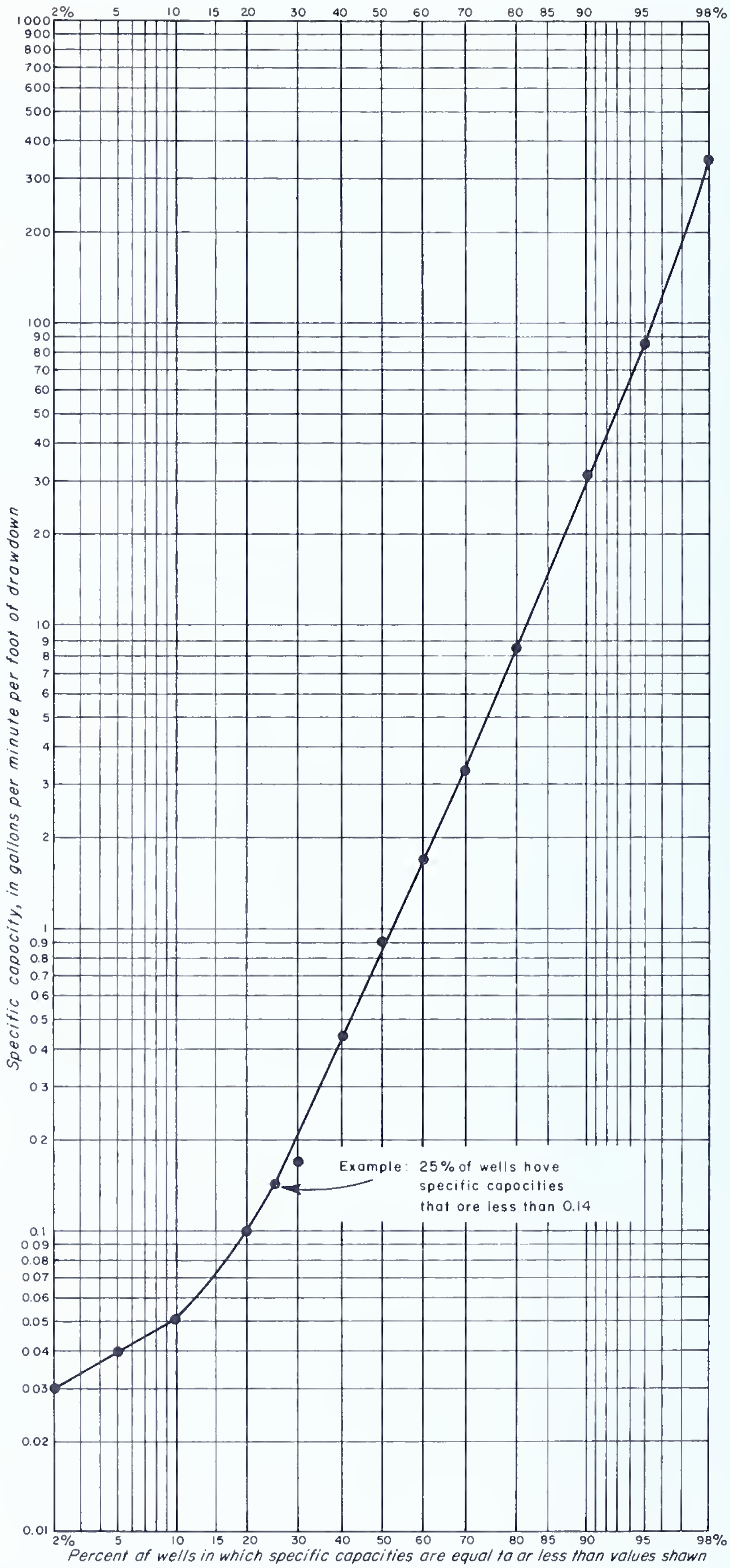


Figure 4. Graph showing the cumulative frequency distribution of specific capacities of 247 wells.

The principal use of these specific capacities is to permit comparison between wells that tap different geologic units, are situated in different topographic locations, or are drilled to different depths. In addition, these computations are useful in indicating, in a general way, the suitability of wells for various purposes. Wells in the carbonate rocks that have specific capacities of less than 0.08 gpm per ft are usually inadequate or barely adequate for domestic use. Specific capacities of 0.08 and 0.3 gpm per ft are generally sufficient for domestic use. Wells having specific capacities of 0.1 to 0.7 may be adequate for farm and commercial use. Wells having specific capacities of 0.5 to 5 are generally suitable for small public supplies and some industries. Wells having specific capacities greater than 5 are generally suitable for public supply and industrial use.

Specific capacities of the 247 test wells range from 0.02 to 600, and the median is 0.91. The cumulative frequency distribution of specific capacities is shown in Figure 4. Seventeen percent of the specific capacities are less than 0.08 (the minimum considered suitable for domestic use) and 75 percent are less than 5.0 (the minimum sufficient for public supply or industrial use).

These calculated specific capacities have two shortcomings. First, a 1-hour test is inadequate to determine the performance of a well over long periods. Second, the wells in most cases were pumped at relatively low rates, generally between 5 and 15 gpm. In aquifers as heterogeneous as the carbonate rocks, the specific capacity of a well determined at a low pumping rate may not be indicative of the well's specific capacity at a much higher pumping rate.

Most of the cumulative frequency-distribution plot of specific capacities approximates a straight line, indicating that specific capacities have a log-normal distribution. The points on the lower end of the graph are above this straight line largely because the calculated specific capacities include the effect of water stored in the borehole. In a 6-inch well, approximately 0.025 gpm per ft of the specific capacity at the end of 1 hour of pumping is directly attributable to water stored in the borehole; therefore, in wells of very low specific capacity, the effect of such stored water is substantial, and in wells of moderate or high specific capacity, the effect is negligible.

Specific capacities of pumped wells appear to be related to topography. Figure 5 shows the percentage distribution of specific capacities (grouped according to topographic position) of all wells except those in the Conestoga Formation. Wells in the Conestoga Formation were not included, because the Conestoga's topography differs markedly from that of the other carbonate formations and the topography is not readily divided into similar topographic positions. Of 183 wells plotted in Figure 5, 70 are in valleys, 37 are on ridges, and 76 are in intermediate

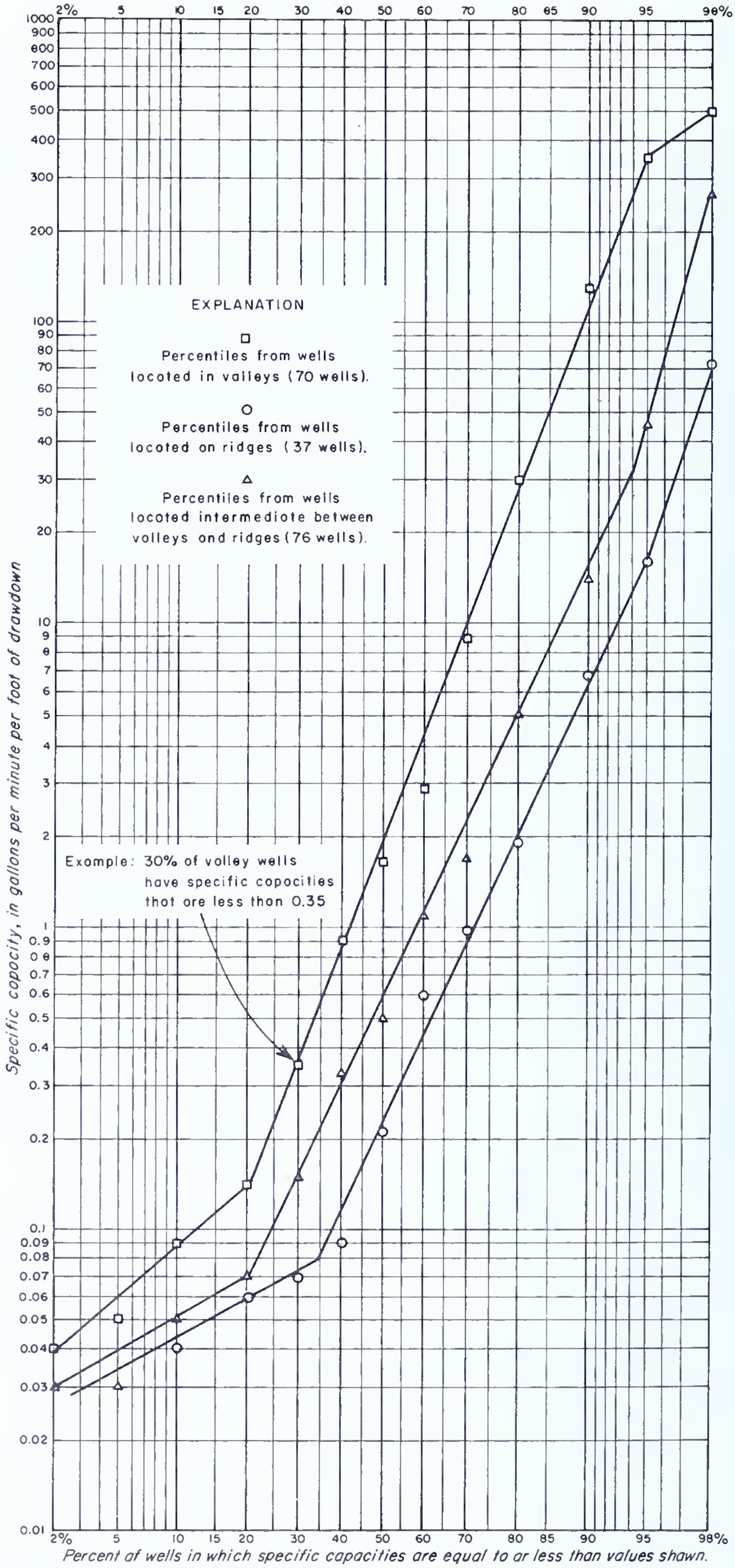


Figure 5. Graph showing the cumulative frequency distribution of specific capacities of wells grouped according to topographic position.

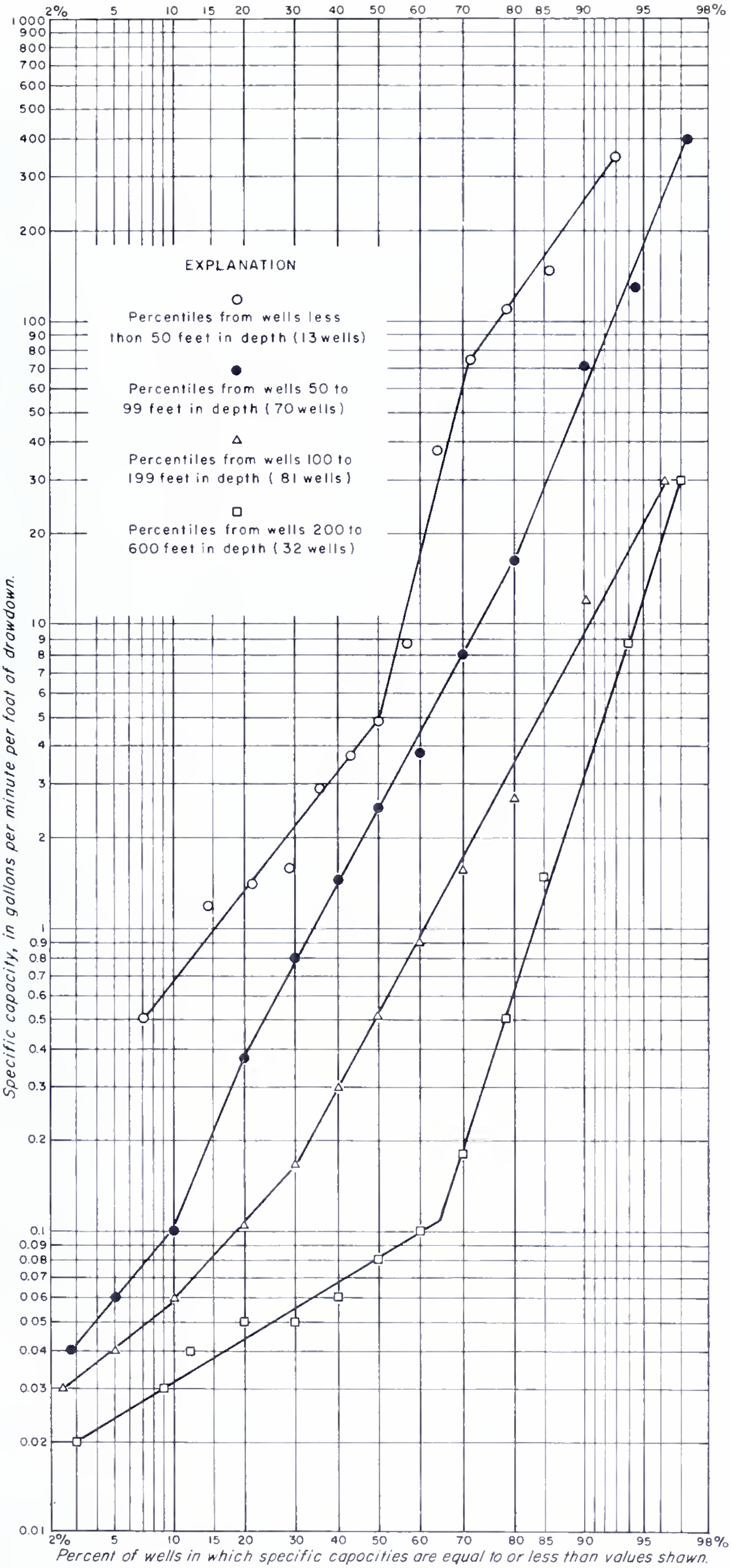


Figure 6. Graph showing the cumulative frequency distribution of specific capacities of wells grouped according to depth.

topographic positions. Specific capacities of wells in valleys are generally greater than those of wells on ridges. Specific capacities of wells in topographic positions intermediate between ridges and valleys are generally greater than those of wells on the ridges but are less than those of wells in the valleys. Probably the clearest indication of differences between the specific capacities of wells in the three topographic positions is given by the distribution of wells having high specific capacities. Twelve of the 16 wells having specific capacities greater than 50 gpm per ft are in valleys, 3 are intermediate in position, and only 1 is on a ridge. Of 9 wells having specific capacities greater than 100 gpm per ft, 7 are in valleys, 2 are in intermediate positions, and none are on ridges.

Specific capacities of wells appear to be related to the depths of the wells. Figure 6 shows the percentage distribution of specific capacities of wells grouped according to their depth. In general, shallow wells have the highest specific capacities and deeper wells have the lowest specific capacities. This relationship is shown also in Table 2, which gives the median specific capacity for wells grouped according to depth. Median

Table 2. Median specific capacities of wells grouped according to well depths

Depth of wells (feet below land surface)	Median specific capacity (gpm per ft of drawdown)	Number of wells
Less than 50	4.8	13
50-99	2.5	70
100-199	.51	81
200-600	.08	32

specific capacity decreases from 4.8, for wells less than 50 feet deep, to 0.08 for wells 200 to 600 feet deep.

This relationship of specific capacity to well depth indicates that in those areas where little or no water occurs at shallow depth it is unlikely that the yield of a well can be increased appreciably by deepening the well; instead the possibility of obtaining an adequate supply of water is increased by drilling another well.

QUALITY OF WATER

Dissolved mineral matter in ground water is derived from soluble mineral matter in the atmosphere, soil, and rocks through which the water moves. The chemical quality of ground water is thus governed chiefly by the nature of the soil and rock through which the water passes,

by the length of time the water has been in contact with these materials, and by human activities such as the disposal of waste and the use of fertilizer and insecticides.

Forty-seven chemical analyses of water from 37 wells and springs in the carbonate rocks of the Lancaster quadrangle are given in Table 6. The discussion that follows is based upon 37 of these samples—one from each well or spring.

Ground water in the carbonate rocks of the Lancaster quadrangle is of the calcium bicarbonate type. The major cations in the water, in order of abundance, are calcium (Ca), magnesium (Mg), sodium (Na), and potassium (K). The major anions, in order of abundance, are bicarbonate (HCO_3), sulfate (SO_4), nitrate (NO_3), chloride (Cl), and fluoride (F).

The median, 10-percentile, and 90-percentile concentrations of each of these constituents and of other constituents and properties of the ground water are given in Table 3.

Table 3. Summary of chemical quality of ground water

Constituent or property	Concentration in ppm, except for pH[1]		
	10 percentile[2]	Median	90 percentile[3]
Iron (Fe)	0.05	0.11	0.68
Calcium (Ca)	58	83	133
Magnesium (Mg)	12	23	45
Sodium (Na)	2.9	6.2	26
Potassium (K)	1.0	2.4	7.0
Bicarbonate (HCO_3)	189	286	376
Sulfate (SO_4)	11	46	93
Chloride (Cl)	7.2	16	46
Fluoride (F)	.0	.1	.2
Nitrate (NO_3)	3.8	33	100
ABS	.01	.07	.14
Dissolved solids	270	391	568
Total hardness (as $CaCO_3$)	232	308	430
pH	7.20	7.46	7.75

[1] Based on 37 samples, except ABS which is based on 35 samples.
[2] Ten percent of samples have concentrations less than the value shown.
[3] Ninety percent of samples have concentrations less than the value shown.

A few of these constituents are present in undesirably large quantities in the water from some wells and thus limit the usefulness of the water or require the water to be treated. Hardness in water forms scale in boilers, water heaters, and pipes, and consumes soap. Water from the carbonate rocks is very hard—only one well of the 37 wells sampled yielded water having a hardness of less than 200 ppm.

According to the U. S. Department of Health, Education, and Welfare (1962, p. 48-50), water containing more than 45 ppm nitrate is potentially dangerous when used in infant feeding. Infant methemoglobinemia, a disease characterized by certain blood changes and cyanosis, may be caused by the high nitrate concentrations in the water. Thirteen of the 37 sampled wells yielded water containing more than 45 ppm nitrate.

Iron in excessive amounts stains laundry a reddish-brown color and imparts an objectionable taste to water. The maximum iron content of drinking water recommended by the U. S. Department of Health, Education, and Welfare (1962, p. 43) is 0.3 ppm. The iron concentration exceeded 0.3 ppm in water from five wells in the Lancaster quadrangle.

The specific conductance of water is the ability of the water to conduct an electric current. It is generally expressed in micromhos per centimeter at 25°C. Field determinations of specific conductance were made on samples from approximately 460 wells, including 44 of the 47 samples sent to the laboratory for complete chemical analysis. The relation between field determinations of specific conductance and dissolved-solids content of the 44 samples is shown on Figure 7. The coefficient of correlation is 0.97 (the coefficient of correlation is 1.00 for a perfect correlation). Because of this close correlation, Figure 7 can be used to convert the 460 field determinations of specific conductance shown in Table 4 to dissolved-solids content.

CONCLUSIONS

Ground water in the carbonate rocks occurs in bedding and cleavage planes, joints, faults, and other fractures. Where these openings have been enlarged by solution, large amounts of water may be available. The number and size of the openings and the degree of interconnection between them determine the ability of the carbonate rocks to transmit water.

The specific capacities of 247 wells were determined in order to evaluate the ability of the carbonate rocks to yield water to wells. The specific capacities, determined from 1-hour pumping tests, ranged from 0.02 to 600 gpm per foot. Twenty-five percent were less than 0.14, 50 percent were less than 0.91, and 75 percent were less than 5.0.

Specific capacities of wells in carbonate rocks appear to be related to topography, and wells in valleys generally have the greatest specific capacities. Of 16 wells having specific capacities greater than 50, 12 are

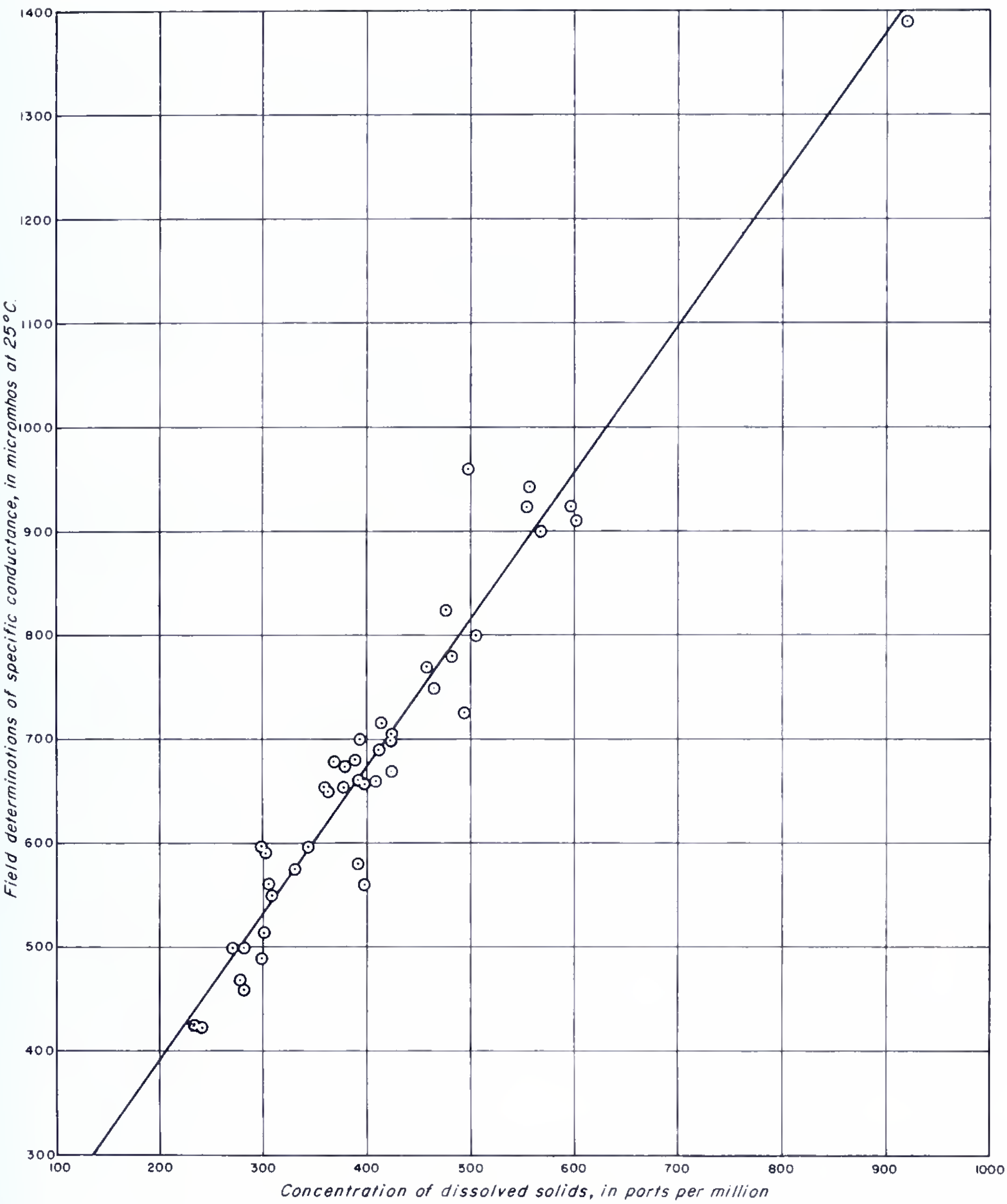


Figure 7. Graph showing the relation of field determinations of specific conductance to dissolved-solids content.

in valleys, 3 are intermediate in topographic position, and 1 is on a ridge. Of 9 wells having specific capacities greater than 100, 7 are in valleys, and 2 are in intermediate positions.

A general relationship exists also between specific capacities and depths of wells. Shallow wells generally have the highest specific capacities, and deeper wells have the lowest. Median specific capacity is 4.8 gpm per ft for wells less than 50 feet deep, 2.5 for wells 50 to 99 feet deep, 0.51 for wells 100 to 199 feet deep, and 0.08 for wells 200 to 600 feet deep. In areas where little water is encountered at shallow depths, it is unlikely

that the yield of a well can be increased appreciably by deepening the well. The probability of finding moderate quantities of water in the carbonate rocks, therefore, is increased by drilling several shallow wells instead of one deep well.

Ground water in the carbonate rocks is of the calcium bicarbonate type. The water is very hard—only 1 of 37 wells sampled has a hardness of less than 200 ppm. Nitrate contamination is common, as 13 of the 37 wells sampled contain more than 45 ppm nitrate, the maximum considered acceptable by the U. S. Department of Health, Education, and Welfare.

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TABLES 4, 5, and 6

Table 4. Record of wells

Well number: See text for description of well-numbering system.
Method of construction: Drl, drilled.
Total depth: R, reported.

Static water-level: R, reported.
Use: A, air conditioning; C, commercial; D, domestic; I, industrial; Irr, irrigation; 0, observation; Ps. public supply; S, stock; U, unused.

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality (Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality (Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
000-615-1	Roy Eshelman	R. Myers' Sons, Inc.	1953	Drl	6	55 R		9-11-63	48	0.2	D		
2	Phares W. Livengood	Wm. Myers	1957	Drl	6	153 R	12	9-11-63	35	4.4	D, S	800	18
3	Clarena K. Keener		1953	Drl	6			9-12-63	12	.2	D	660	
616-1	Aaron Brubaker	R. Myers' Sons, Inc.	1959	Drl	6	94 R	20	9- 9-63	20	2.9	D, S	800	17
2	Norman E. Davis		1953	Drl	6			9-10-63	32	8.5	D	600	16
3	Steward Grim	Wm. Myers		Drl	6	60 R		9-12-63	26	3.9	D	800	17
617-1	L. Ralph Frey		1949	Drl	6	120 R		9- 9-63	36	.17	D	620	16
2	Richard H. Witmer	P. Myers	1960	Drl	6			9- 6-63	33	.43	D, S	530	13
618-1	Robert S. Shenk	Martin Fischer	1952	Drl	6	206 R		8-28-63	89	.11	D	1000	24
2	Sterling Elmer	R. Myers' Sons, Inc.	1955	Drl	6	65 R	40	9- 6-63	55	11	D, S	920	19
3	Melvin M. Groff	do	1963	Drl	6	82 R		9-13-63	56	50	D, S	650	15
619-1	Theodore Eastridge			Drl	6	44		8-28-63	37	3.7	D	480	11
2	Barry McComsey	R. Myers' Sons, Inc.	1960	Drl	6			9- 5-63	79	2.6	D	1300	18
620-1	John M. Hoffman	C. E. Miller	1950	Drl	6	45 R		8-23-63	30	4.8	D	440	9
2	Millersville Borough Authority	P. Myers		Drl	6	502 R		8-30-63	217	8.7	Ps	750	17
621-1	do	R. Myers' Sons, Inc.	1953	Drl	6	300 R		8-30-63	63	.14	Ps	690	15
2	do			Drl		120 R		8-30-63	53	3.1	Ps	750	17
3	Cameron Hawley		1950	Drl	6	150 R		9- 4-63	13	2.2	D, S	500	13
622-1	Abram Kilheffer			Drl	6	38		5-21-63	29	110	D, S	550	15
2	Elton Hostetter	Miller	1954	Drl	6	180 R		9- 4-63	40	.10	S	700	15
623-1	Willis Hess		1958	Drl	6			8-16-63	56	18	D	380	9
2	Paul Moseman	C. E. Miller	1952	Drl	6	110 R		8-19-63	52	2.6	D, S	375	8
624-1	Howard Shaub	do	1961	Drl	6	230 R		5-24-63	54	.05	D	425	10
2	Paul H. Rohrer		1945	Drl	6	80 R		5-31-63	19	12	D, S	430	14
625-1	Jacob L. Hess			Drl	6			5-27-63	30	130	D	380	11
2	David K. Miller	Martin Fischer	1960	Drl	6	75 R		8-21-63	35	4.6	D	440	10
627-1	Robert H. Rohrer			Drl	6			5-28-63	48	34	D, S	710	18
2	Mrs. Elmer Charles		1900	Drl	6			6-14-63	43	4.8	D, S	610	16
628-1	Edward Broomer			Drl	6			6-13-63	19	49	D	490	13
001-615-1	J. J. Fritz	P. Myers	1963	Drl	6	200 R		9-11-63	7	.1	S	650	14
2	Robert D. Shoff	do	1949	Drl	6	70 R		9-11-63	12	.04	D	800	17
616-1	Lee Brenner			Drl	6	50 R		9-13-63	8	4.7	C	1090	24
2	H. R. Albright	R. Myers' Sons, Inc.	1963	Drl	6	102 R		9-23-63	26	.52	D	690	17
617-1	Sam Sinopoli	P. Myers	1948	Drl	6	85 R		8-28-63	41	2	C	940	22

2	Rockford Museum	Herr The Pump Man		Drl	6			9- 6-63	32	2.6	C		
619-1	Maynard Southard			Drl	6	80 R		8-28-63	30	.09	D	750	16
2	David T. Copenhafer			Drl				9- 5-63	43	.66	D	400	9
3	Richard Fitzgerald	P. Myers	1949	Drl	6	108 R	35	8-30-63	24	16	D	640	14
620-1	John H. Hartlieb			Drl		125 R		8-23-63	32		D		
2	Robert Hudson	Wm. Myers	1959	Drl	6	110 R		8-27-63	70	0.8	D	850	19
621-1	John M. Kilheffer	R. Myers' Sons, Inc.	1959	Drl	6	90 R	30	8-22-63	40	.43	D	750	15
622-1	L. Howard Martin	do	1961	Drl	6			5-24-63	48	.51	D	720	22
2	H. H. Haverstick, Jr.			Drl	6			8-26-63	12	13	S	540	12
623-1	Ivan Charles, Sr.	Martin Fischer	1958	Drl	6	50	18	5-23-63	22	3.2	D, S	950	24
624-1	Harold Wilkinson			Drl				8-22-63	10	.44	D		10
001-625-1	Ray W. Gibble	R. Myers' Sons, Inc.	1952	Drl	6	90 R		5-27-63	38	1.2	D		
2	Charles S. Habecker		1900	Drl	6	65 R		5-31-63	44	.37	D, S	380	10
3	Jacob Siegrist	R. Myers' Sons, Inc.	1952	Drl	6	155 R				1.6	Irr	220	5
628-1	Morris Kauffman		1900	Drl	6			6- 7-63	6	.59	D	590	18
2	R. P. Williams			Drl	6					2	D	700	20
002-615-1	Charles B. Hess	P. Myers	1947	Drl	6	400 R		8- 6-63	91	.02	S	1390	29
2	Permutit Co.	do	1954	Drl	8	125 R		8-12-63	31	23	I	690	16
3	James R. Landis	do	1948	Drl	6	79 R		8-13-63	44	16	D, S	1130	25
616-1	John G. Fetter		1949	Drl	6	152		8-19-63	51	.21	D	1210	28
617-1	Eher Reese			Drl	6	<57		8-27-63	22	30	I	1100	24
618-1	Watt and Shand		1936	Drl	6	155 R	60	9- 5-63	23	8.2	A		
2	do		1924	Drl	6	265 R	160	9- 5-63	41		A		
619-1	Charles Spidle	Ben Miller	1934	Drl	6	90 R		8-30-63	20	4.5	C	950	21
2	Robert McMurtrie		1958	Drl	6	180 R		9- 5-63	17	.41	D	780	21
621-1	Harry L. Overton	Myers	1933	Drl	6	290 R		9- 3-63	44	.26	D	900	17
2	A. D. Medsger		1926	Drl	6	74		9- 3-63	42	.03	D		
3	Harry Kreidy	R. Myers' Sons, Inc.		Drl	6	136		8-27-63	38	8	D	540	11
622-1	Gulf Oil Corp.			Drl	6			6-13-63	14	.92	C	550	18
623-1	Frank Henne		1946	Drl	6	129 R		5-20-63	46	.06	D	440	15
2	Ben E. Mann Estate	Miller		Drl	6	100 R		5-20-63	8	3.8	S	480	14
624-1	Garden Spot Air Park Inc.			Drl	6	76		5-21-63	17	1.4	C	450	12
2	Amos Burkhart		1935	Drl	6	80 R		5-23-63	9	31	D	370	11
3	Martin Fischer	Martin Fischer	1953	Drl	6	<100 R		6-12-63	7	.12	D	340	9
626-2	Maurice Roth			Drl	6	155 R		6-10-63	24	.06	D	560	16
627-1	William Dellet	Martin Fischer	1959	Drl		170 R		6- 7-63	20	20	Ps	800	26
003-615-1	Benjamin F. Haum	R. Myers' Sons, Inc.	1950	Drl	6	80 R		8- 6-63	24	.58	D		19
2	Robert Glass	P. Myers	1963	Drl	6	145 R	4	8- 8-63	20	.42	S	590	14
616-1	H. Eshelman	do		Drl	6	289 R	1	8-14-63	27	.67	D	590	16
2	Amos S. Keene	Miller	1934	Drl	6	92 R	5	8-22-63	46	2.6	D	860	20
617-1	Consumer Ice Co.	R. Myers' Sons, Inc.	1957	Drl	8	150 R	50		20 R	40	I		
2	do			Drl	6	475 R					I		
3	Mr. Esbenshade			Drl	6	60 R		8- 1-63	17	8	D	610	16
618-1	Julia Hagen	R. Myers' Sons, Inc.	1956	Drl	6	65 R		8-26-63	32	14	D	700	16
619-1	Calder Mfg. Co.			Drl	6	31		8-22-63	12	1.4	Ps	580	15
620-1	Joseph B. Resch	R. Myers' Sons, Inc.	1953	Drl	6	<50 R		8-15-63	8	.91	D	475	12
621-1	Jessee Epps			Drl	6	55		8-16-63	34	.6	D		
2	Mr. Brubaker			Drl	6	49		8-19-63	35	38	D	550	13
3	Glenn Huber .			Drl	6	>200		8-20-63	33	.57	D	1225	26
4	Mrs. Louis Lockwood			Drl	6	80 R		8-26-63	30	.12	D	775	18

Table 4. Record of wells—Continued

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality (Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality (Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
622-1	Haldy Becker	H. K. Honberger Sons	1946	Drl	6	144 R	69	8-16-63	49	.03	D	750	15
2	Robert M. Steffy			Drl	6	65 R		6-27-63	29	3.4	D	360	8
624-1	Chris Miller Estate			Dug				10-12-62	23		D, S	330	9
2	Dave Hostetter			Dug		29		10-12-62	27		D	320	8
3	Sander Machine Co.	Aaron W. Martin	1951	Drl	6	195 R		10-23-62	37		D, I	310	8
4	Eugene Hinerdeer			Drl				10-23-62	45		D	370	9
5	do			Dug				10-23-62	40		S	450	10
625-1	Musser Potatoe Chips, Inc.	H. K. Honberger Sons	1962	Drl	8	90 R		10- 9-62	14		I	550	11
2	David H. Hubley			Drl				10- 9-62	20		D	520	12
3	Joseph Sebelist		1961	Drl	6	80 R		10- 9-62	30	130	D		
4	Amos K. Mellinger		1959	Drl	6	160-180 R		10-23-62	40	0.16	D	640	13
5	do			Dug		42		10-23-62	36		U		
				Dug		27		10-24-62	23				
6	Jacob L. Charles			Drl				10-24-62	23		D, S	325	7
				Dug		25		10-24-62	24				
7	John C. Butzer			Drl				10-24-62			D	700	15
626-1	Clayton Diffenderfer			Dug		18		10-24-62	12		U	375	9
2	Alma Ditzler			Drl				10-24-62	18		D	955	18
3	Moses Shirk			Dug				10-24-62	27				
				Drl				10-24-62	27		D	470	10
4	Carl Slinkman			Drl				10-24-62	17		D	320	7
5	Joseph Forrest			Dug		55		10-24-62	29		U		
6	Jacob Bowers			Dug		50		10-24-62	47		D, S	315	7
7	Joseph Forrest			Dug		42 R		10-24-62	20		D	370	9
8	Edward Getz		1942	Drl	6	52		10-24-62	27		D	400	9
627-1	West Hempfield Township	H. K. Honberger Sons	1958	Drl		500 R		10-10-62	38		Ps		
2	Minnie Habacker			Dug		27		10-12-62	11		D	900	18
3	Lloyd Miller	H. K. Honberger Sons	1962	Drl	6	400 R		6-12-62	62	1.5	D	450	11
628-2	Margaret Ness	Kauffman	1958	Drl	6	78 R		10-10-62	36		D	925	26
629-1	J. Arthur Swarr	H. K. Honberger Sons	1948	Drl	6	127 R		10-10-62	63	0.17	D, S	840	19
2	Howard Witmer	do		Drl	6	80 R		10-10-62	47		D	450	10
3	John H. Conrad			Drl	6			10-10-62	51		Ps	450	11
004-615-1	C. L. Heller			Drl	6	>200 R		8- 8-63	147	0.03	D, S		
2	Mr. Shoab			Drl	6	111		8-14-63	19	.14	D		
3	Ralph Hubley	H. K. Honberger Sons	1963	Drl	6	142 R	8	9- 3-63	21	.09	C	1350	26
616-1	H. C. Burrichter			Drl		228 R		8-13-63	87	.06	D	490	16

617-1	Lloyd Moore	H. K. Honberger Sons	1947	Drl	6	118		7-25-63	61	.06	Ps	1090	24
004-617-2	E. R. Royer Estate	P. Myers	1960	Drl	6	160 R	12	7-29-63	16	0.52	D, S		
3	Humble Oil Co.			Drl	6	101		9-23-63	9	.58	C	640	16
618-1	Erb Bros. Inc.		1930	Drl	6	218		7-26-63	29	.06	D, Irr	980	22
619-1	Edgar Sterrett			Drl	6			6-26-63	33	2.5	D		
2	Wm. Schwartz	R. Myers' Sons, Inc.	1938	Drl	6	70 R		7-31-63	13	.37	D	650	15
620-1	Fildor Realty	do	1959	Drl				6- 9-63	21	1.9	C	1040	23
2	Clair Benton			Drl	6			6-14-63	24	.09	C	960	19
3	Quaker State Metals Co.	R. Myers' Sons, Inc.	1962	Drl	6	82		7- 1-63	42	85	I	500	15
4	do	do	1962	Drl	6	222 R	43	7- 1-63	43		U		
5	do	do	1962	Drl	6	70	43	7- 2-63	40	2.9	O	590	18
6	do	do	1962	Drl	6	262 R	41	7- 2-63	26		U		
7	do	do	1962	Drl	6	67	60	7- 5-63	33	11	O	690	20
8	do	do	1962	Drl	6	90	42	7- 3-63	28	1.5	U	1250	17
9	do	do	1962	Drl	6	202 R	41	7- 3-63	21		U		
10	do	do	1962	Drl	6	27	26	7- 7-63	17	2.9	U		
11	do	do	1962	Drl	6	202 R	43	7- 7-63	17		U		
12	do	do	1962	Drl	6	222 R	22				U		
13	do	do	1962	Drl	6	102 R	20				U		
14	do	do		Drl	6	117 R	20				I		
15	do	do		Drl	6	76 R					I		
16	do	do		Drl	12	58 R					I		
17	do	do		Drl	6	122 R	42				U		
18	do	do		Drl	6	142 R	42				U		
19	do	do		Drl	6	110 R	22				I		
621-1	Roy Mosemann	Martin Fischer	1953	Drl		65 R		6-24-63	29	1.2	D, S	725	18
622-2	Boyd Abbott, Jr.			Dug		16		10-25-62	13		D	480	10
3	Moses Stoltzfuss			Dug		18		10-25-62	15		U		
4	Harry Swarr			Dug		12		10-25-62	11		D	400	8
5	Henry C. Leary		1948	Drl	6	26 R	13	8-20-63	8	8.8	D, S	450	9
623-1	Robert Haverstein			Dug		49		10-22-62	46		U		
2	Richard Shotzberger			Dug		35		10-25-62	31		D	350	7
624-1	Isaac Stoner			Dug		8		10- 9-62	7		D, S	520	13
2	Raymond Kauffman			Drl	6			10- 9-62	6	0.04	S	450	11
3	East Hempfield Water Authority	H. K. Honberger Sons		Drl		265 R		10-22-62	20	30	Ps	410	10
4	Daniel M. Heisey	R. Myers' Sons, Inc.	1955	Drl		60 R		10-22-62	16		D, S	600	15
5	do			Dug		21		10-22-62	17		U		
6	D. Baker Kauffman			Dug		19		10-22-62	11		S	690	16
7	David Miller			Dug		52		10-23-62	50		D	800	16
8	J. H. Kaufman			Drl	6			10-23-62	23		D, S	450	9
625-1	S. B. Nolt	R. Myers' Sons, Inc.	1915	Drl	6	68 R		10- 5-62	18		D, S	470	12
2	Elizabeth Young			Dug		24		10- 5-62	22		S		
3	Clarence Nolt			Dug		43		10- 5-62	40				
				Drl							D	575	14
4	do	R. Myers' Sons, Inc.		Drl	6	165 R	65	10- 5-62	38		S	500	11
5	Lester Charles			Drl	6	88 R		10- 8-62	20		D	630	15
6	Elmer S. Musser			Dug		30		10- 9-62	27				
				Drl							D	500	12
7	Daniel G. Forrey			Dug		20		10- 9-62	17		D, S	470	11
8	Elmer Musser			Dug		23		10- 9-62	22				
				Drl							D	510	13

Table 4. Record of wells—Continued

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality (Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality (Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
9	Robert Bender			Dug		20		10-22-62	13		D, S		
10	Amherst Industries		1947	Drl	6	175 R		10-22-62	11		Ps, I	650	17
004-626-1	Paul E. McKinney			Dug		36		10- 2-62	31		D, S	450	14
2	do	H. K. Honberger Sons	1960	Drl	6	63	11	10- 2-62	37	200	U		
3	Daniel H. Fox			Dug		33		10- 2-62	28		D	500	15
4	R. J. Kline	Sam Kaylor	1960	Drl	6	79 R		10- 2-62	38	0.1	D	540	14
5	do			Dug		30 R		10- 2-62	26		U	410	12
6	Ernest J. Sauder	Martin Fischer	1953	Drl	6	200 R		10- 2-62	49	0.05	D, S	750	20
7	do	Peter Sheim	1936	Drl		90 R		10- 2-62	7		U	750	19
8	do			Dug		19		10- 2-62	16		U		
9	Lloyd Nolt	R. Myers' Sons, Inc.		Drl	6	19		10- 2-62	10		D	440	12
10	do	do	1936	Drl	6	105 R		10- 2-62	36		D	590	15
11	do			Dug		19		10- 5-62	15		U		
12	R. B. Nolt			Dug		21		10- 5-62	15		D, S	850	17
13	J. Harlan Burkhart		1954	Drl	6	>125 R		10- 5-62	13	0.22	D, S	550	14
14	E. Robert Nolt			Dug		12		10- 5-62	8		D, S	500	13
627-1	John Melhorn			Dug		20		9-24-62	18		U		
2	Paul Conley			Drl				9-24-62	7	0.62	D, S	450	16
3	Herbert Hilkemeir			Drl	6	30 R		9-24-62	26		D	750	27
4	Paul Conley			Dug		30		9-24-62	24				
			1900	Drl		150		9-24-62	24		D, S	700	19
5	Howard Musser			Dug				10-10-62	30		D, S	560	13
6	Emma Musser			Dug		15 R		10-24-62	14		U		
628-1	Henry Miller	R. Myers' Sons, Inc.		Drl	6			9-24-62	78		D, S	600	17
2	do			Dug		16		9-24-62	14		U	650	19
3	Amos Martin			Drl	6	87 R		9-24-62	25	0.96	D, S	700	17
4	Chris Nolt, Sr.	R. Myers' Sons, Inc.	1956	Drl	6	140 R		9-25-62	34		D, S	740	16
5	Nissley Estate	do		Drl	6	90 R		9-25-62	59		D, S	650	18
6	Robert Lichtz		1908	Drl		58		9-25-62	29	2.4	D, S	1040	22
7	Lloyd Miller	H. K. Honberger Sons	1958	Drl	6	425 R	60	10-12-62	64		Ps	580	13
8	do	do	1957	Drl	6	290 R	60	10-12-62	36		Ps		
629-1	Henry Mellinger			Drl	6			9-25-62	41		S	900	20
2	Kenneth Alexander	R. Myers' Sons, Inc.		Drl	6	143 R	16	9-25-62	52		D	1200	29
3	Lloyd Derr			Drl				9-25-62	48		D	980	22
4	William K. Fogie	R. Myers' Sons, Inc.	1940	Drl	6	72		9-25-62	41		D, S	750	15
5	Charles Gantz			Dug		41		9-26-62	37		D	650	11

6	Charles Fogie			Dug		31		9-26-62	30		D	580	11
7	Warren Fletcher		1950	Drl	6	200 R					D	590	15
8	Donald L. Miller			Dug		60 R		9-26-62	50		D	375	7
9	do			Drl	6	123 R		9-26-62	109	0.15	D	760	19
10	C. S. Loechner			Drl	6			9-26-62	86		D	740	20
11	Clyde Mumma			Dug		36		9-26-62	27		D, S	620	16
12	Cyrus Graybill	H. K. Honberger Sons		Drl	6	79 R		9-26-62	54		D, S	600	16
005-615-1	C. Sinz	R. Myers' Sons, Inc.	1963	Drl	6	160 R	20	7-23-63	31	0.1	D	590	15
2	E. E. Murry		1961	Drl		221 R		7-24-63	56	.1	D	650	18
616-1	Elmer Landis		1948	Drl	6	160		7-17-63	32	.1	D	550	14
617-1	E. J. Danz	R. Myers' Sons, Inc.	1950	Drl	6	51		7-18-63	30	.36	D	540	14
618-1	Charles C. Dombach			Drl	5			7-31-63	18	6	D, S		15
2	Robert T. Campbell		1955	Drl	6	76		8-27-63	39	3.8	D	520	13
619-1	Mrs. M. L. Smith	R. Myers' Sons, Inc.	1949	Drl	6	60		6-21-63	52	74	D	360	9
2	Bell Telephone Co.	Ernst	1956	Drl	6	96 R	40			.38	C		10
620-1	S. Clyde Weaver, Inc.	R. Myers' Sons, Inc.	1960	Drl	6	143 R		6- 6-63	42	.59	D, C	640	17
2	Walter E. Evans	P. Myers	1946	Drl	6	69 R		6-17-63	21	2.6	D	630	11
621-1	Elmer K. Kreider	R. Myers' Sons, Inc.	1961	Drl	6	175 R	20	6-18-63	19	0.65	S	480	13
2	P. G. Gingrich		1953	Drl	6	81		6-21-63	23	6.8	D	700	14
622-1	Selena Landis			Dug		14		11- 1-62	11				
		R. Myers' Sons, Inc.		Drl							D	605	15
				Dug				11- 1-62	20				
2	John S. Landis	do	1957	Drl	6	232 R	23	11- 1-62	19	0.09	S, Irr	1700	28
3	do			Dug		22		11- 1-62	20				
				Drl							D	925	22
4	Wayne Hottenstein			Dug		20		11- 1-62	19		D, S	950	19
5	J. Mark Swarr			Dug		21		10-25-62	17		D, S	670	15
6	Landis Metzler			Dug		12		11- 2-62	7		D	560	14
7	do	R. Myers' Sons, Inc.		Drl	7	25		11- 2-62	5		S	605	15
8	Paul L. Neff		1943	Drl		147 R		6-18-63	24	0.91	D, S	690	18
9	Suburban Propane Co.		1953	Drl	6	60 R		6-14-63	22	28	C	520	13
623-1	W. Scott Nissley			Dug		51		10-23-62	9		U		
2	Benjamin Landis	H. K. Honberger Sons	1962	Drl	6	260 R		10-23-62	33	0.05	O	490	
3	do			Dug		36 R		10-23-62	32		U	345	9
4	do	H. K. Honberger Sons	1962	Drl	5	52 R		10-23-62	29		D, S	370	9
5	Anna Bowers			Dug		16 R		10-25-62	12		D	600	15
6	Lloyd Denlinger			Dug		16		10-25-62	14		D	580	14
7	John Hartman	H. K. Honberger Sons	1947	Drl	6	60 R		10-25-62	22		D		
8	do			Dug		28		10-25-62	22		U		
9	W. E. Alexander	R. Myers' Sons, Inc.	1954	Drl	6	180 R		10-26-62	32	0.06	D		
10	Martin B. Thomas			Dug		19		10-26-62	14		D, S	650	16
11	Earl Landis	Sam Kaylor	1959	Drl	6	102 R		11- 1-62	23		D, S	740	18
12	do			Dug		14		11- 1-62	11		D	655	9
13	John B. Gochnauer	R. Myers' Sons, Inc.	1956	Drl	6	129		11- 1-62	17	0.17	O	545	
14	John B. Gochnauer			Dug		11		11- 1-62	5		D	650	14
15	Warren Witmer			Drl	6	125					S	710	16
16	do			Drl	6	47		11- 2-62	15		U	1100	22
17	Leroy Bricker	R. Myers' Sons, Inc.		Drl	5	120 R		11- 7-62	41		D, Ps	625	16
18	D. G. Nelson	do		Drl		200 R		11- 1-62	9		D	790	17
624-1	Arthur Miller		1937	Drl		170 R		10-22-62	16	2.2	D	350	9

Table 4. Record of wells—Continued

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
2	J. B. Mumma Estate			Dug		17		10-22-62	15		U		
3	do			Drl	7	117		10-22-62	11		D, S	480	12
4	J. Harold Kauffman			Dug		22		10-22-62	18		D	350	8
5	Barton Gehman			Dug		19		10-26-62	13		U		
6				Dug		10		10-26-62	8				
7	Walter C. Doerr			Dug		16		10-30-62	12		U		
8	Henry J. Wickenheiser			Dug		26		10-30-62	12		U		
9	Harry S. Mumma			Drl	6	95		9-24-62	26		D	810	21
10	do			Dug		21		9-24-62	16		S	745	20
625-1	Raymond Hess			Drl	6	67		10- 5-62	3		Irr		
2	Edward Wissler			Drl		180 R		10- 8-62	24		U		
3	do			Dug		27		10- 8-62	23		S	480	12
4	J. Clayton Bender			Dug		37		10- 8-62	24		U		
5	do	R. Myers' Sons, Inc.	1959	Drl	6	230 R	35	10- 8-62	23		D, S	740	17
6	John L. Charles	M. A. Stoltzfuss	1950	Drl	6	88 R		10- 8-62	24	0.64	D, S	960	23
7	Ben Hess			Dug		25		10-30-62	22		S		
626-1	J. Miller Eshelman & Son, Inc.			Drl	6	545 R		10- 1-62	178		D, S	640	17
2	J. Miller Eshelman & Son, Inc.			Drl	6	193		10- 1-62	21		U		
3	J. Lester Charles	Sam Kaylor		Drl	6	192 R	50	10- 1-62	29	1.7	D	640	18
4	do			Dug		29		10- 1-62					
5	Minnie Gantz			Drl	6	42		10- 1-62	30		U		
				Dug		22		10- 2-62	17				
6	Jacob Burkhart			Drl	6	159		10- 2-62	44		D, S	650	18
				Dug		29		10- 8-62	23				
		R. Myers' Sons, Inc.	1960	Drl	6	300 R		10- 8-62	23		D, S	800	20
627-1	J. H. Nissley			Dug		40 R		9-20-62	34		D, S	640	17
2	do			Dug		26		9-20-62	19		D	640	14
3	John Nissley			Dug		12		9-20-62	11		D	530	14
4	Mrs. Amos Newcombe			Drl				9-20-62	36		D	625	18
5	Mrs. Elizabeth Newcomer			Dug		36		9-20-62	26		D	1200	30
6	do			Drl	6	46		9-20-62	19	1.2	S	450	11
7	Joseph A. Hook		1870	Dug		34		9-28-62	32		D, S	550	13
8	do	R. Myers' Sons, Inc.	1941	Drl		120 R		9-28-62	32	1.6	D, S	525	13
9	Henry Eby			Dug		29		10- 1-62	28		U		
10	E. W. Wissler	Gill	1930	Drl	6	150 R		10- 1-62	67	0.95	D, S	710	18
11	do			Dug		35		10- 1-62	24		U		
12	J. Newcomer			Dug				10- 1-62	16		D, S	640	17

13				Drl	6			10- 1-62	32		U	625	17
14	Eshelman's Quarry			Drl	6			10- 1-62	22		C	610	16
628-1	Engel Bros.	R. Myers' Sons, Inc.	1957	Drl	6	190 R	20	9-20-62	42	.21	D, S	600	18
2	do		1850	Dug		35		9-20-62	19		U		
3	Ralph S. Martin			Drl	6			9-20-62	48		D, S	450	11
4	Mrs. Henry Engel	Herr The Pump Man		Drl	6			9-20-62	47		D	480	14
5	Paul Newcomer	R. Myers' Sons, Inc.	1932	Drl	6	189 R	20	9-20-62	62	0.12	D, S	780	18
6	Paul Newcomer			Dug		60 R		9-20-62	33		U		
7	J. Newcomer			Dug		37		9-20-62	34		D, S	690	20
8	Albert Habecker	R. Myers' Sons, Inc.	1937	Drl	6	205		9-21-62	91	0.07	D, S	750	23
9	do			Dug		63		9-21-62	47		U		
629-1	Lloyd Swarr		1923	Drl	6	160 R					D, S	750	14
2	Jacob Ginder			Drl		55 R		9-21-62	20 R		D	800	21
3	Benjamin Ginder			Dug		45		9-21-62	39		D, S	460	15
4	Paul Erb	R. Myers' Sons, Inc.	1959	Drl	7	141 R	12	9-21-62	65		D, S	1000	28
5	Daniel Stoltzfus			Dug		47		9-21-62	28		U		
6	do			Drl				9-21-62	64	0.08	D, S,	840	26
006-615-1	John H. Shirk		1926	Drl	5	75 R		7-17-63	39	1.1	D	700	15
2	Menonite Mission Board	R. Myers' Sons, Inc.	1963	Drl	8	110 R	22	7-19-63	17	7.3	Ps	600	16
616-1	Ira D. Landis	do	1958	Drl	6	200 R		7-18-63	13	.06	D, S	650	18
617-1	Sanford Leaman	do	1958	Drl	6			7-11-63	38	46	D, S	900	18
2	Witmer Bros.		1920	Drl	6	126		7-16-63	11	.17	D, S	760	18
3	Sensennich Corp.		1939	Drl	8	265 R		8- 5-63	50	.5	I	980	19
618-1	Halbert Brubaker		1929	Drl	6	57		7-10-63	34	1.4	D	900	21
2	Martin Erb	R. Myers' Sons, Inc.	1941	Drl	6	84 R		7-11-63	13	.7	D	550	13
619-1	Leon H. Groff		1942	Drl		80 R		6- 9-63	28	.07	D		
2	Charles J. Doerr		1920	Drl	10	34		7- 8-63	28	.5	D	700	16
620-1	Lloyd R. Vogel	R. Myers' Sons, Inc.	1941	Drl	6	144 R	13	9-17-63	22	1.3	D	680	14
621-1	McMinn Asphalt	do	1951	Drl	6	80 R		6- 5-63	33	8	C	525	16
622-1	Leroy Hottenstein			Dug				10-31-62	28				
				Drl		92 R		10-31-62	28		D, S	1410	27
2	Clarence Metzler			Dug				10-31-62	14		U		
006-622-3	Clarence Metzler			Dug		35		10-31-62	16		D, S	535	13
4	A. S. Root			Dug		27		11- 2-62	20		D, S	950	18
5	Chester H. Hummer			Dug		28 R		11- 2-62	23		D	640	12
6	Marvin Hollinger			Dug		23		11- 2-62	14		D	675	15
7	M. H. Martzall			Dug		27		11- 2-62	27		U		
8	Willis Kilheffer	R. Myers' Sons, Inc.	1951	Drl	6	160 R		6-10-63	39	0.09	D, S	990	23
9	Nora Landis			Drl	6	80		9-17-63	21	.07	D	3000	36
623-1	David G. Wenger			Drl		24		9-26-62	18		D, Irr		
2	do			Drl				9-26-62	19		D, Irr	620	14
3	Henry S. Lehman			Dug				9-26-62	30				
				Drl							D	655	16
4	Nelson Cooper			Dug		15		9-26-62	14		D	490	13
5	Henry Kettering			Dug		26		9-26-62	21		U	790	18
6	do		1957	Drl	6			9-26-62	21	0.05	D, S	945	22
7	do			Drl							D	1150	28
8	do			Dug		26		9-26-62	18		U		
9	Mrs. Clyde Kreider			Drl		125		9-26-62	11		D		
10	Clyde Hottenstein		1932	Drl	6	151		9-28-62	34		S	555	17
11	Edwin Sauder	R. Myers' Sons, Inc.	1957	Drl	6	125 R		10-30-62	17		U		

Table 4. Record of wells—Continued

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality (Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality (Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
12	John B. Noll			Drl		220 R		10-30-62	36		U	1230	24
13	do			Drl	6	96 R		10-30-62	33	29	D, S	1480	22
14	do			Dug		36		10-30-62	28		U		
15	John F. Cope			Dug		27		10-30-62	31		U		
16	do	R. Myers' Sons, Inc.		Drl		63 R		10-30-62	32		U		
17	John F. Cope	R. Myers' Sons, Inc.		Drl		400 R		10-30-62	29		O		
18	do	do		Drl		450 R		10-30-62	31		U		
19	Elam Bollinger			Dug		18		10-31-62	11		D	1120	26
20	Daniel Rohrer, Jr.			Dug		28		10-31-62	26		D, S	600	15
21	Daniel Lehman			Dug		15		10-31-62	11		D, S	690	16
22	Leroy Hottenstein	Martin Fisher	1958	Drl	6	142		10-30-62	22	0.11	D, S	440	11
23	do			Dug		27		10-31-62	18		U	1000	23
24	Arthur J. Ulrich		1942	Drl	6			10-30-62	25		D	630	14
624-1	John G. Weidler			Drl		204 R		9-24-62	16		D, S	1110	28
2	do			Dug		22		9-24-62	18		U		
3	do			Drl		40 R		9-24-62	21		U	995	28
4	Willis Weaver			Dug		17		9-24-62	12		D	625	16
5	do			Dug				9-24-62	7		D	710	17
6	Emma Gaul			Dug		11		9-25-62	10		D, S	535	14
7	Amos Roland			Dug		26		9-25-62	21		D	700	19
8	do			Dug		15 R		9-25-62	12 R		S, Irr	570	15
9	Albert Nissley			Dug		24		9-25-62	22		D, S	805	21
10	Mylin Good			Dug		44		9-25-62	28				
				Drl		120 R					D	755	19
11	do			Dug									
				Drl		122		9-25-62	22		S	1070	31
12	Kendig Rohrer	R. Myers' Sons, Inc.	1962	Drl		300 R		9-25-62	14 R		S	555	17
13	do			Dug		16		9-25-62	13		D	615	17
14	J. Robert Eshelman			Dug		24		9-25-62	22		D, S	605	16
15	Wm. C. Burkhardt	R. Myers' Sons, Inc.	1947	Drl	6	225 R		9-28-62	23	0.05	D	655	16
16	Charles Sload	R. Myers' Sons, Inc.	1958	Drl	6	160 R	15	9-28-62	27		D		
17	Mrs. Marie Reineare			Drl		163		9-28-62	15		U		
18	do		1960	Drl	6			9-28-62	25		D	640	17
19	Henry Rohrer			Dug		37		11- 7-62	35		D, S	775	16
20	Gustaf E. Malmborg			Dug		16		11-16-62	8		D, Irr	570	15
21	William Dyer			Drl		170 R		11-16-62	27	0.03	D, S,	770	21
22	do			Dug		37		11-16-62	10		U		
23	Menna W. Heisey			Dug		9		11-16-62	5		D, S	715	17

625-1	Howard Peifer	R. Myers' Sons, Inc.		Drl		200 R		10-29-62	74	0.03	S	980	24
2	Verne Hiestand	H. K. Honberger Sons	1936	Drl	6	190 R		10-30-62	19	.51	D	980	19
3				Dug		12		10-30-62	8			710	16
4	Frank Eshelman			Drl	6	45 R		11-16-62	12		S	900	18
5	do			Dug		38		11-19-62	37				
				Drl		175 R		11-19-62			D, S	680	19
6	Joseph R. Smith	Samuel Kaylor	1959	Drl	6	92 R		11-19-62	11		D	525	14
7	Ira Williams			Dug				11-19-62	14		D	1275	25
8	J. R. Nissley			Dug		30		11-19-62	21		U	1300	
9	Weidler Grube			Dug		16		11-19-62	12			690	17
10	Elam Longenecker			Dug		38		11-19-62	29		D, S	640	15
626-1	Bear Creek Construction Co.			Drl	6			10-29-62	41		C	580	15
2	Wm. B. Hall			Drl				10-29-62	27	0.04	D	640	18
3	R. C. Steinmetz			Drl		240 R		10-29-62	69		D		
4	Enos W. Witmer			Dug				10-29-62	19				
				Drl							D	700	17
5	P. Elias Young	H. K. Honberger Sons	1961	Drl		65 R		10-29-62	24	22	D	600	15
6	I. J. Metzler			Dug		31		11-23-62	30		U		
7				Dug		15		11-29-62	13		D	640	14
627-1	Paul S. Miller			Dug		49		9-28-62	39		D, S	725	14
2	Daniel S. Will			Dug				9-28-62	17				
3	Hiram Strickler			Drl				9-28-62	17		D	700	15
				Dug				9-28-62	19				
		R. Myers' Sons, Inc.	1952	Drl		102 R	20	9-28-62	19		D	900	20
4	do			Drl	6			9-28-62	63	0.02	D, S		
5	do			Drl	6			9-28-62	62		D, S	740	16
6	do	R. Myers' Sons, Inc.	1959	Drl	6	243 R	20	10- 1-62	27		D, S	500	11
7	do			Dug		29		10- 1-62	9		U		
8	Mrs. Paul L. Weiser			Dug		42		10-29-62	40		D, S	600	13
9	Norman Shenk	R. Myers' Sons, Inc.	1961	Drl		120 R		11-28-62	15		Ps		
10	do	do	1961	Drl		125 R		11-28-62	17		U		
				Dug		38		11-28-62	34				
11	Harold W. Wert			Drl							D	650	15
				Dug		43							
12	J. Roy Breneman	R. Myers' Sons, Inc.	1936	Drl		500 R		11-29-62	40		D, S	550	12
13	do		1957	Drl				11-29-62	29	74	D, S	570	13
628-1	Mark Newcomer		1800	Dug		38		9-28-62	36		D, S	750	15
2	Donald Newcomer			Dug		65		9-28-62	59		U		
3	do			Drl		82		9-28-62	63	4.8	D	700	17
4	Londa Zurin			Dug				9-28-62	52		U	425	8
5	Harold Long	H. K. Honberger Sons	1956	Drl	6	200 R		9-28-62	33		D	600	15
6	Donald Newcomer			Dug		62		10- 8-62	58		D, S	400	11
7	John S. Haines			Drl				10-30-62	41		D	880	15
8	Bruce Hiett	R. Myers' Sons, Inc.	1950	Drl	6	233 R	23	11-29-62	57		D	590	12
9	J. B. Hostetter			Drl	6			11-29-62	53	58	D, S	550	13
10	Arthur Horner			Dug		53		11-29-62	51		D, S	420	10
629-1	Joseph Wolgmuth, Jr.			Drl	6			9-19-62	45		D, S	870	22
2	J. Sherk			Dug		34		11-28-62	27				
				Drl		86		11-28-62	27		U		
3	Richard Oldwiler	R. Myers' Sons, Inc.	1957	Drl		127 R	8	11-28-62	42	0.05	D	730	20

Table 4. Record of wells—Continued

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality (Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality (Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
4	Henry E. Shenk			Drl		31		11-28-62	26		D, S	550	14
007-615-1	Edward Hess		1952	Drl	6			7-19-63	28	130	D, S	650	16
2	Maurice Young		1950	Drl	6			7-18-63	32	14	D	560	14
616-1	D. Martin Zimmerman		1962	Drl	5	110		7-16-63	32	.3	D, S	730	16
2	Warren Snyder	H. K. Honberger Sons	1957	Drl	6	240 R		7-18-63	43	.06	D, S	710	18
618-1	Jacob Toews	R. Myers' Sons, Inc.	1962	Drl	6	80 R	30	7-17-63	27	.69	S	580	14
2	R. D. Buckwalter	do	1952	Drl	6	550 R		7-21-63	33	.1	D, S	730	25
3	do	do	1948	Drl	6	275 R		7-21-63	26	6	D, S		
4	Mrs. Helen Thomas	do	1963	Drl	8	101	30	7- 8-63	25	.98	D	560	14
619-1	Enos Good	H. K. Honberger Sons	1962	Drl	6	140	20	7-16-63	26	2.8	D, S	600	16
620-1	Henry Delp	Samuel Kaylor	1959	Drl	6	143 R	17	7-16-63	40 R		D	950	18
2	Dale L. Landis	R. Myers' Sons, Inc.	1962	Drl	6	60 R		6- 6-63	37	1.7	D, S	525	16
3	Ivan Snyder	do	1956	Drl	6	195 R					D, S	625	16
621-1	Willis Peifer	do	1958	Drl	6	122 R	20	7-15-63	19	65	D	500	13
2	Daniel Martin	H. K. Honberger Sons	1958	Drl	6	140 R		7-17-63	31	.51	D, S	600	12
622-1	Elam Landis			Dug		36		11- 5-62	33		D, S	325	8
2	Clarence Landis			Drl	6	51		11- 5-62	37		D	550	12
3	G. Longenecker			Drl		74		11- 5-62	35		U		
4	do	R. Myers' Sons, Inc.	1952	Drl	6	120 R		11- 5-62	38	12	D, S	540	12
5	Mary Grayle	Sam Kaylor		Drl	6	200 R		11- 5-62	34		D, S	525	13
6	do			Dug		35		11- 5-62	30		U		
7	A. H. Whistler	R. Myers' Sons, Inc.		Drl	6			11- 6-62	44	0.3	D, Irr	840	14
8	Aaron L. Martin	do	1961	Drl	6	120 R		11-15-62	28	1.5	D, S		
9	do			Drl	6	58		11-15-62	27		U		
10	Menna W. Hoffer			Dug		27		11-15-62	21		D, S	735	18
11	Edward Nixdorf			Drl	6	125		6- 6-63	28	0.33	D, S	600	15
623-1	Clarence Keener, Jr.			Drl				11-14-62	32	.07	D, S	575	14
2	Annamae Hausman			Dug		21		11- 7-62	18		D	660	13
3	do	R. Myers' Sons, Inc.	1914	Drl	6	75 R		11- 7-62	8		D	650	15
4	Titus Nolt			Dug		23		11- 9-62	17		Irr	680	17
5	Robert N. Miller			Dug		18		11- 9-62	16		D	570	15
6	John L. Cassel	R. Myers' Sons, Inc.	1946	Drl	6	128 R		11-14-62	14	2.5	C	690	18
7	do			Dug		22		11-14-62	15		D	655	15
624-1	John Cope			Dug		21		11- 6-62	19		D	380	9
2	Henry W. Stauffer			Dug		15		11- 6-62	12		D, S	610	15
3	Mervin Hess			Dug		12		11- 6-62	10				
				Drl	6	59		11- 6-62	11		D, S	700	13
4	Amos Sauder			Dug		26		11- 6-62	23		D, S	890	16

5	John M. Becker			Dug		27		11- 7-62	24		D	550	13
6	Willis Z. Esbenshade	R. Myers' Sons, Inc.	1961	Drl	6	250 R	30	11- 7-62	26		D, S	590	13
7	do			Dug		17		11- 7-62	14		U		
8	Clayton R. Nissley			Dug		16		11- 7-62	13		D, S	600	15
9	Leroy Esbenshade			Drl	6	180 R		11- 9-62	20	0.93	S	2300	
10	Lucy C. Gross Trust Estate	R. Myers' Sons, Inc.	1930	Drl	6	170 R		11- 9-62	18		D	640	15
11	do			Dug		22		11- 9-62	16		U		
12	do			Dug		23		11- 9-62	20		S	650	16
13	Harry Becker			Dug		18		11-14-62	15		U		
625-1	John N. Metzler		1945	Drl		306 R		11- 7-62	22		D, S	525	14
2	Mrs. John Eby	R. Myers' Sons, Inc.	1943	Drl	6	98 R		11-15-62	26		D, S	590	13
3	do	do	1957	Drl	6	67 R		11-15-62	23	8.5	Irr	570	13
4	Leon Schnupp			Dug		32		11-15-62	26		U	740	14
5	Wilmer Esbenshade	R. Myers' Sons, Inc.		Drl	6	>600 R	200	11-16-62	105		D, S	740	17
6	do			Dug		54		11-16-62	40		Irr	945	19
7	do			Dug		58		11-16-62	39				
				Drl		176		11-16-62	39		U		
8	John N. Metzler			Dug		35		11-16-62	32		D, S	500	12
9	Harold Witmer			Dug		20		11-19-62	16		D, S	500	13
10	Howard Brubaker	R. Myers' Sons, Inc.		Drl	6	60 R		11-19-62	44		D, S	400	9
11	Pennsylvania State University			Dug		25		11-19-62	20		D		
12	do			Drl				11-19-62	20		Irr	620	14
626-1	J. Earl Witmer	R. Myers' Sons, Inc.	1961	Drl	6	160 R		11-19-62	24		D	790	22
2	E. Witmer			Dug		34		11-21-62	30		U	540	11
3	do			Drl				11-21-62	47		D, S	660	14
4	Jacob H. Harnish		1907	Drl	6	180		11-21-62	34		U		
5	Nissley Erb		1906	Drl	6	80 R		11-21-62	37	8.7	D, S	650	14
6	C. Robert Fry	R. Myers' Sons, Inc.	1957	Drl	6	150 R		11-21-62	44		D, I	630	15
				Dug		42		11-21-62	41		D, S	1140	22
7	H. Henry Martin			Drl		200 R		11-21-62	41				
627-1	Roy Henny			Dug		40		11-21-62	33		U		
2	do	R. Myers' Sons, Inc.		Drl		238		11-21-62	26		U		
3	Lester Gehman			Dug		48		11-21-62	37		U		
4	Henry L. Shelley		1930	Drl		156		11-23-62	49	0.05	D, S	550	12
5	Henry E. Shenk			Dug		44		11-23-62	39		D, S	625	13
				Dug		43		11-23-62	41				
6	J. Harold Esbenshade	R. Myers' Sons, Inc.		Drl	6	180 R		11-23-62	56	600	D, S	635	13
7	Leroy Kopp			Dug		42		11-23-62	25		U		
8	Henry Miller			Dug		42		11-23-62	38		D, S	500	12
9	Harry K. Shenk			Dug		44		11-26-62	33		U		
628-1	Harry Musser, Jr.			Dug		68		11-26-62	47				
		H. K. Honberger Sons		Drl		100 R		11-26-62	47		S, Irr		
2	do	R. Myers' Sons, Inc.	1958	Drl	6			11-26-62	62		D, S	515	12
3	do	do	1962	Drl	5	203		11-26-62	58	0.18	U	500	
4	Levi Snyder			Dug		62		11-26-62	60		D, S	460	10
5	Benjamin S. Ebersole			Drl	6	94 R		11-26-62	65		D	580	14
6	Jonas B. Brubaker			Drl		216 R		11-26-62	49		U	280	6
7	W. S. Carter	H. K. Honberger Sons	1942	Drl	6		65	11-26-62	35		D	400	10
8	Amos N. Shelley	R. Myers' Sons, Inc.		Drl	6	80 R		11-27-62	37		D, S	555	14
9	do			Dug		59		11-26-62	37		U		
12	Clarence Douple	R. Myers' Sons, Inc.	1948	Drl		120 R		11-27-62	37		D	705	13

Table 4. Record of wells—Continued

Well number	Owner	Driller	Date completed	Method of construction	Diameter of casing (inches)	Total depth (feet)	Depth to bottom of casing (feet)	Static water level: Date measured	Static water level: Depth below land surface (feet)	Specific capacity (gpm per foot)	Use	Water quality (Field analysis)[1]: Specific conductance (micromhos at 25°C)	Water quality (Field analysis)[1]: Hardness as $CaCO_3$ (grains per gallon)
				Dug		64		11-27-62	50				
13	Gruber Bros.			Drl				11-27-62	50		D, S	690	16
14	Roy Sauder			Dug		54		11-27-62	49		U		
629-1	David G. Miller			Dug		22		11-27-62	21		D, S	500	12
2	James Garber			Drl		168 R		11-28-62	28	0.04	S	810	20
3	J. B. Hostetter			Drl	6			11-28-62	20		U		
4	do			Drl		25 R		11-28-62	11	1.6	D, S	505	12
5	Mr. Thomes			Drl		39		11-28-62	29		U	850	21
008-616-1	C. P. Wenger			Drl				7-22-63	28	0.05	D, S	630	15
618-1	Paul Coble		1959	Drl	6	200 R		6-28-63	41	.05	D	510	15
619-1	Lanco		1945	Drl	6	135 R		7-17-62	37	.1	C	630	18
2	Earl Minnich	R. Myers' Sons, Inc.	1955	Drl	6	180 R		8-15-63	39	.5	D, S	700	15
620-1	John D. Burkholder	do	1959	Drl	6	100 R		6-27-63	44	.97	D, S	550	15
2	Alfred Longer		1951	Drl	6			7-15-63	38	1.2	D	670	16
622-1	Ivan Hoover			Drl	6			7-15-63	42	.05	D, S	520	14
623-1	John K. Cassel			Dug		29		11- 9-62	26		U		
2	A. H. Weidman	R. Myers' Sons, Inc.	1924	Drl	6	98 R		11- 9-62	21		D	525	15
3	do			Dug		27		11- 9-62	24		U		
4	Manheim Auto Auction			Drl	6	160 R		11-14-62	23		C	490	13
5	Kauffman Menonite Church			Dug		35		11-14-62	23		D, S	800	18
6	do		1961	Drl	6	<100 R		11-14-62	27		D	710	18
7	Paul G. Brubaker			Dug		23		11-15-62	14		D, S	370	9
624-1	John K. Cassell	R. Myers' Sons, Inc.		Drl	6	180 R	20	11-14-62	10	1.7	Ps, S	570	13
2	do			Dug		14		11-14-62	5		U		
3	do			Dug		11		11-14-62	6		Irr	690	19
4	Ralph Gibble	R. Myers' Sons, Inc.		Drl	6	66		11-15-62	3		D	600	16
626-1	Andrew N. Miller	do	1957	Drl	6	150 R	12	11-15-62	39	13	D, S	575	16
2	do			Dug		56		11-15-62	42		U		
3	Isaac Garman			Drl		59		11-21-62	32		D, S	520	11
4	Isaac Garman			Dug		44		11-21-62	34		U		
5	Katie Hoover			Drl	6			11-23-62	25	0.15	D, S	600	14
009-615-1	Alan Balmer	R. Myers' Sons, Inc.	1948	Drl	6	265 R	35	7-25-63	48	.03	D		
2	Harold Spangler		1941	Drl	6	101 R		7-26-63	22	.35	D, S	650	17
616-1	Richard Hess	Aaron Martin	1953	Drl	6	240 R		7-22-63	72	.05	S	600	14
2	Titus B. Martin			Drl	6			7-22-63	39	6.3	D, S	450	10
617-1	George Miles		1951	Drl	6	70 R		7-26-63	29	1.8	D		
2	Samuel Kulp	R. Myers' Sons, Inc.	1950	Drl	6	135 R		8- 1-63	9	.14	Ps	530	12
3	Animal Trap Co.			Drl	8	27 R		8- 2-63	6	350	I	620	13

8	Animal Trap Co.												
618-1	Robert Risser	R. Myers' Sons, Inc.	1961	Drl	6	132 R		7-29-63	19	.14	D	540	13
2	Morgan Paper Co.		1930	Drl		42 R					I	550	12
3	do	R. Myers' Sons, Inc.	1942	Drl	10	123 R	12		6 R		I	550	13
4	Lititz Water Co.			Dug		27 R			23 R		Ps		
5	do			Drl	10	91 R			33 R	500	Ps		
6	do			Drl	10	66 R			6 R	400	Ps	515	
7	do			Drl	10	118 R				500	Ps		
8	Paul Enck, Jr.	R. Myers' Sons, Inc.	1962	Drl	6	86 R		8-20-63	44	.05	D	480	11
9	Scott Garman	do	1960	Drl	6	62 R		8-20-63	53	72	D	500	11
619-1	John B. Kendig, Jr.			Drl	6			6-28-63	44	.54	D, Irr	650	16
2	Joseph Burkholder			Dug									
				Drl	6			7-12-63	42	0.04	D, S	500	14
620-1	Carl Longenecker		1943	Drl	6	90 R		6-25-63	33	.15	D, S	690	19
2	Paul E. Balmer	R. Myers' Sons, Inc.	1953	Drl	6	90 R	20	6-25-63	42	16	D, S	800	20
3	Frank Earhart			Dug				7-12-63	60				
				Drl	6			7-12-63	61	0.07	D, S	600	17
621-1	Paul Sauder		1957	Drl	6	100 R		6-26-63	38	30	D, S		
622-1	Clarence Keener		1937	Drl	6	145 R		7-11-63	27	0.06	D, S	830	19
2	do	R. Myers' Sons, Inc.	1956	Drl	7	265 R		1956	35 R		Irr	1100	22
623-1	David Moseman	do	1956	Drl	6	200 R		7-11-63	30	6	C		
2	U. S. Asbestos Co.		1954	Drl	8	300 R	32				I		
3	do			Drl		312 R					I		
4	do	R. Myers' Sons, Inc.	1961	Drl	8	42 R	24			150	I		
010-615-1	Adam Oberholtzer	do	1954	Drl	6	81 R	6	7-25-63	21	1.9	D	1100	23
2	Ira Good			Drl	6			8-14-63	12	3.8	D, S	600	13
618-1	R. W. Sauder			Drl	6	100 R		7-29-63	42	.48	I	730	17
619-1	Ira Hess		1955	Drl	6	145 R		6-26-63	49	.20	D	510	17
620-1	Erbs Mennonite Church	M. A. Stoltzfuss		Drl	8	120 R		6-25-63	55	1.9	Ps	550	18
621-1	J. Robert Shenk			Drl	6	150 R		6-26-63	47	1.6	D, S		
622-1	Noah Kreider & Sons	R. Myers' Sons, Inc.	1957	Drl	8	300 R	22		17 R		Irr	600	16
011-615-1	Melvin Oberholtzer	Samuel Kaylor	1962	Drl	6	270 R	30			0.06	D, S	550	14
2	Edward K. Bollinger			Drl				8-15-63	83	.03	D, S	530	12
616-1	Paul B. Martin	R. Myers' Sons, Inc.	1963	Drl	6	142 R	21	8-14-63	20	.16	D, S	560	13
2	Jacob Holsinger	Grant	1962	Drl	6	95 R		8-19-63	12	.2	U	660	15
012-615-1	Alvin W. Adams	R. Myers' Sons, Inc.	1959	Drl	6	156 R		7-31-63	57	.04	D	550	11
2	Titus Martin	do	1960	Drl	6	42 R		8- 2-63	12	74	D	500	10
3	Irwin Martin			Drl	6	240 R		8- 2-63	76	.27	D, S	660	15
616-1	Melvin Brumbach		1925	Drl	6	102 R		7-31-63	23	.2	D, S	480	12
2	Elam Shirk	Robert Grant	1959	Drl	6	260 R	40	8-14-63	52	.04	D, S	540	11
617-1	Charles W. Loose			Drl	6			8- 1-63	9	.10	D		
013-615-1	Edward Stahl	John and Alan Mays	1960	Drl	6	62 R	62	7-31-63	10	2.2	I	520	13

[1] Date of field analysis measurement is the same as shown for static water level.

Table 5. Record of springs

Use: C, commercial; D, domestic; Irr, irrigation; Ps, public supply; S, stock; U, unused.

Spring number	Owner	Topographic position	Estimated yield (gpm)	Use	Water Quality (Field analysis): Date measured	Specific conductance (micromhos at 25°C)	Hardness as $CaCo_3$ (grains per gallon)
003-625-A	Latan Heisey	Valley floor	...	D, S	10-24-62	250	5
626-A	Ray Rice	do	...	C	10-24-62	340	8
004-620-A	Willis Esbenshade	Head of draw	...	D, S	6-17-63	460	10
624-A	East Hempfield Water Authority	Valley floor	300	Ps	10-22-62	300	7
626-A	R. B. Nolt	do	...	S	10- 5-62	...	..
627-A	John Melhorn	do	10	D, S	9-24-62	640	19
628-A	Rebecca Heisey	do	...	D, S	10-10-62	630	15
005-623-A	Amos R. Herr	do	2	D, S	10-26-62	580	13
626-A	Raymond Hess	do	...	S	10- 5-62	440	10
626-B	B. B. Brannerman Estate	Hillside	..	D, S	10- 8-62	550	14
626-C	Wilbur Heistand	Valley floor	...	D, S	10- 8-62	675	15
627-A	James Newcomer	do	55	D, S	9-24-62	475	14
629-A	Alvin Reist	do	10	D, S	9-21-62	490	15
006-619-A	East Petersburg Water Authority	do	200	Ps	6- 6-63	570	16
622-A	Clarence Metzler	do	10	D, S, Irr	10-31-62	400	10
623-A	Elam Bollinger	Hillside		S	10-31-62	655	18
624-A	Hottenstein Bros.	do	..	D	9-28-62	525	12
624-B	Menno W. Heisey	Valley floor		Irr	11-16-62	560	13
007-619-A	Ivan H. Snyder	do	3	D, S	5-31-63	520	12
624-A	John H. Metzler	do	...	U	11- 7-62	525	15
629-A	James Ganber	Head of draw	...	D	11-28-62	340	8

Table 6. Chemical analyses of ground water in Lancaster quadrangle

(Results in parts per million except as indicated)

Well or Spring number	Date of collec- tion	Temperature (°F)	Silica (SiO_2)	Total iron (Fe)	Total manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)[1]	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	ABS	Dissolved solids	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-car- bonate	Specific conductance (micromhos at 25°C)	pH[1]
Lancaster County																				
000-615-2	10-16-63	54	10	1.2	0.00	117	19	9.1	2.4	253	78	26	0.2	78	0.12	481	370	163	742	7.26
616-1	10-16-63	54.5	9.6	.04	.01	94	16	29	2.4	224	32	62	.1	73	.10	459	300	117	741	7.53
616-1	4-23-64	54.5	8.5	.02	.00	94	16	14	1.5	213	40	36	.0	85	.02	425	301	127	688	7.47
620-2	10-17-63	54.5	11	.08	.00	118	29	18	3.2	376	77	29	.1	11	.06	496	415	109	804	7.24
627-2	6-19-63	57	12	.10	.00	91	12	5.6	1.5	157	52	24	.2	95	.10	398	274	146	588	7.29
001-622-1	6-20-63	55	13	.18	.00	128	17	7.8	1.5	286	85	17	.1	59	.13	494	387	157	758	7.23
623-1	6-19-63	54	13	.16	.00	136	22	17	6.0	250	77	46	.0	142	.22	601	430	229	926	7.14
002-615-1	10-24-63	54.5	8.2	.23	.03	164	54	26	34	351	167	59	.1	212	.21	919	630	346	1,380	7.21
619-1	10-17-63	57	14	.06	.03	142	18	32	4.3	347	93	44	.1	62	.11	586	430	143	941	7.05
-2	10-18-63	54	10	.14	.03	133	21	16	2.2	396	84	20	.1	17	.06	505	420	98	810	7.14
623-2	6-20-63	55	12	.13	.00	75	11	3.4	3.0	210	39	9.2	.1	18	.14	277	232	60	467	7.32
003-615-2	10-16-63	54	7.1	.07	.13	62	37	4.3	3.4	294	22	9.8	.0	57	.09	342	306	69	582	7.46
616-1	10-16-63	55	8.2	.06	.01	67	32	5.0	1.6	296	46	13	.1	9.8	.05	330	300	58	570	7.57
-2	10-15-63	53	8.5	.10	.01	83	54	19	4.1	403	50	27	.0	39	.10	476	430	100	815	7.34
004-616-1	10-24-63	54.5	9.3	.10	.03	60	35	2.6	2.1	331	23	4.2	.2	.3	.02	305	294	23	523	7.55
616-1	4-23-64	53.5	8.8	.12	.00	59	33	3.5	2.0	330	25	3.3	.0	1.2	.00	299	283	14	454	7.61
617-3	10-15-63	53.5	7.9	.25	.11	72	40	6.2	2.0	311	64	19	.1	.5	..	363	344	90	[1]650	7.53
618-1	10-23-63	55	6.3	.09	.11	95	51	24	5.0	408	98	36	.0	28		554	448	118	[1]925	7.32
618-1	4-15-64	55	7.9	.04	.00	94	49	22	7.0	402	95	35	.0	36	.01	556	436	111	923	7.30
004-624-3	3-25-63	54.5	7.8	.00	.00	45	22	5.4	1.5	193	11	16	.0	22	.04	253	204	48	410	7.86
626-2	4- 3-63	54	9.6	.05	.03	60	25	2.4	1.5	243	26	6.4	.0	26	.09	280	257	55	525	7.68
628-7	4-18-63	56.5	8.2	.07	.00	66	39	18	1.0	298	32	34	.0	48	.15	394	321	88	732	7.67
005-620-1	10- 9-63	56	8.2	.08	.11	72	39	4.0	2.0	279	51	16	.1	46		379	340	114	[1]675	7.47
620-1	4-15-64	58	7.6	.02	.00	72	39	6.7	7.0	306	61	18	.0	35	.02	412	340	90	670	7.34
621-1	10- 9-63	55	7.3	.09	.13	48	22	3.0	1.0	189	6	7.2	.0	39	..	234	212	55	[1]425	7.86
621-1	4-16-64	54	6.6	.02	.00	42	21	3.0	4.0	188	7.6	7.4	.0	39	.01	240	192	38	413	7.67
623-2	4- 4-63	56	7.7	.05	.00	58	24	5.6	1.8	236	28	11	.1	22	.09	298	241	53	520	7.83
-13	4- 3-63	54.5	8.2	.27	.02	58	39	1.4	6.0	291	28	4.6	.0	26	.04	325	293	73	545	7.75
629-A	3-25-63	53	8.5	.17	.02	48	7.3	4.7	2.5	114	26	9.2	.0	25	.06	195	140	60	310	7.72
006-617-1	10- 3-63	54	8.8	.07	.06	80	45	12	32	309	60	33	.1	102	..	568	384	134	[1]900	7.30
617-1	4-16-64	53.5	7.3	.02	.00	59	32	7.0	24	245	40	24	.2	69	.03	414	279	79	658	7.31
624-21	4-18-63	56	11	.13	.02	79	37	12	7.0	321	80	17	.0	13	.07	409	434	91	732	7.64
627-4	4-17-63	54	7.7	.03	.00	87	33	5.6	14	338	61	14	.7	14	.08	424	352	80	742	7.49
007-620-2	10- 3-63	54.5	7.7	.48	.43	107	12	4.0	4.2	338	22	9.8	.0	28	..	360	316	47	[1]655	7.32

Table 6. Chemical analyses of ground water in Lancaster quadrangle—Continued

(Results in parts per million except as indicated)

Well or Spring number	Date of collection	Temperature (°F)	Silica (SiO_2)	Total iron (Fe)	Total manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)[1]	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	ABS	Dissolved solids	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH[1]
620-2	4-16-64	53	5.8	.02	.00	101	9.2	3.5	7.0	268	25	12	.0	58	.02	379	290	70	612	7.26
622-7	4-12-63	56	10	.08	.04	88	13	39	2.5	227	24	70	.0	39	.05	424	269	86	713	7.46
627-6	6-20-63	56	8.5	.16	.00	80	16	8.4	1.0	256	7.4	14	.1	46	.11	309	266	58	536	7.42
628-3	4- 4-63	54	8.5	.68	.03	84	11	2.9	1.5	236	21	9.3	.0	33	.10	282	248	66	518	7.55
008-619-1	10-21-63	56	15	.24	.08	101	23	6.5	2.5	354	56	8.0	.1	.2	.	399	348	59	[1]660	7.31
619-1	4-17-64	54	14	.32	.00	96	24	8.0	2.0	359	57	8.4	.0	.2	.00	395	338	45	665	7.28
624-1	4-17-63	55.5	19	.23	.21	83	15	11	2.2	179	105	17	.0	3.8	.03	391	269	126	566	7.20
626-1	4-16-63	54	8.5	.14	.00	83	33	22	6.0	306	21	34	.0	100	.09	465	343	97	766	7.36
009-616-1	10-23-63	54	11	1.78	.07	75	29	4.5	1.0	276	54	13	.1	21	.	370	308	81	[1]680	7.51
616-1	4-23-64	53	10	.07	.00	74	31	6.0	2.0	273	55	19	.0	30	.00	389	312	92	628	7.53
618-6	10-23-63	53	8.7	.11	.05	83	13	6.0	1.5	251	16	13	.1	34	. .	301	260	59	[1]515	7.43
012-615-2	10-21-63	54	7.9	.83	.04	69	18	3.8	1.5	242	9	8.0	.1	37	. .	270	244	49	[1]500	7.48
615-2	4-17-64	53.5	7.1	.02	.00	72	19	4.0	2.0	253	21	10	.0	38	.01	303	258	50	523	7.46

[1] Determined at collection site.